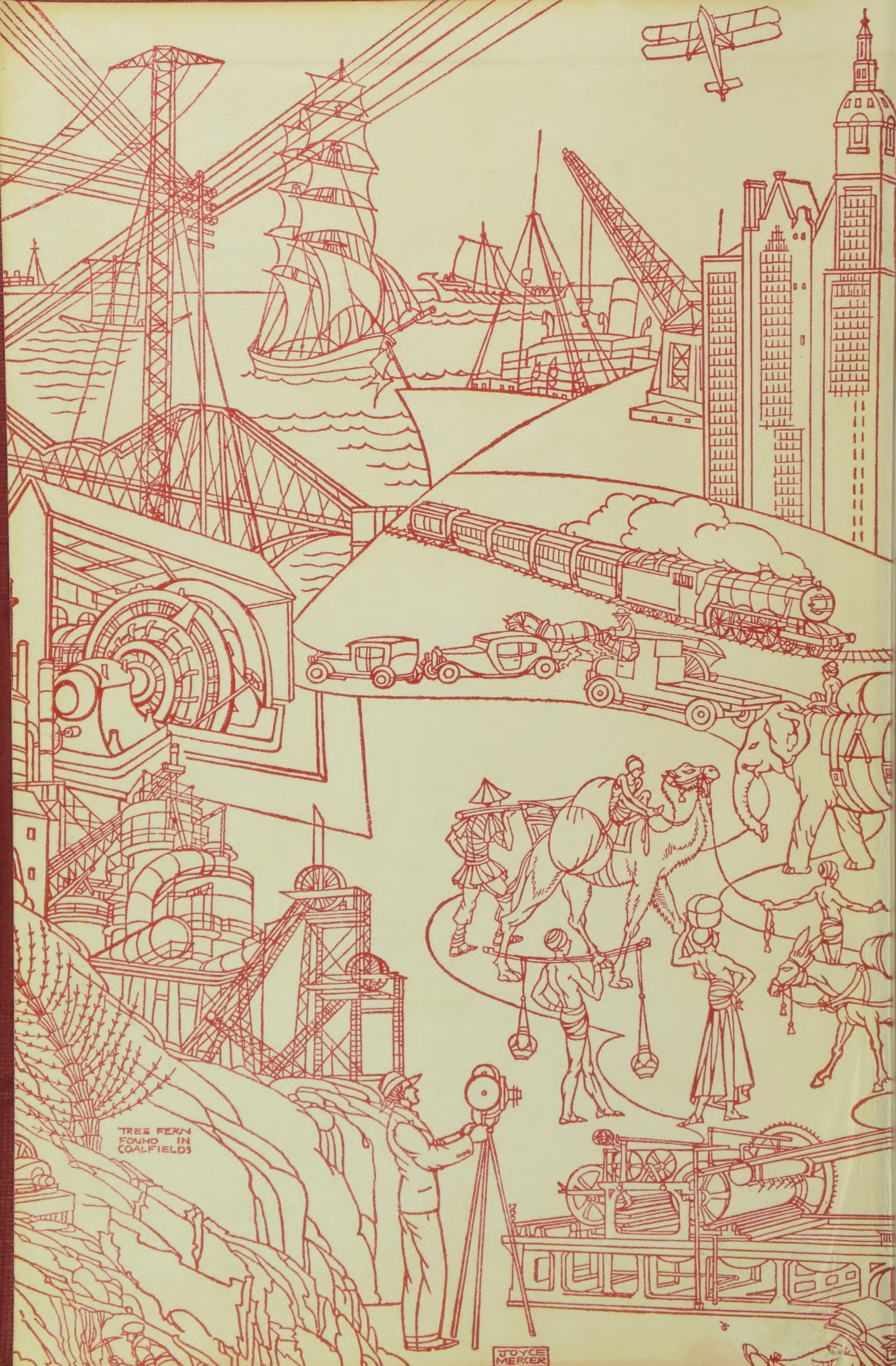
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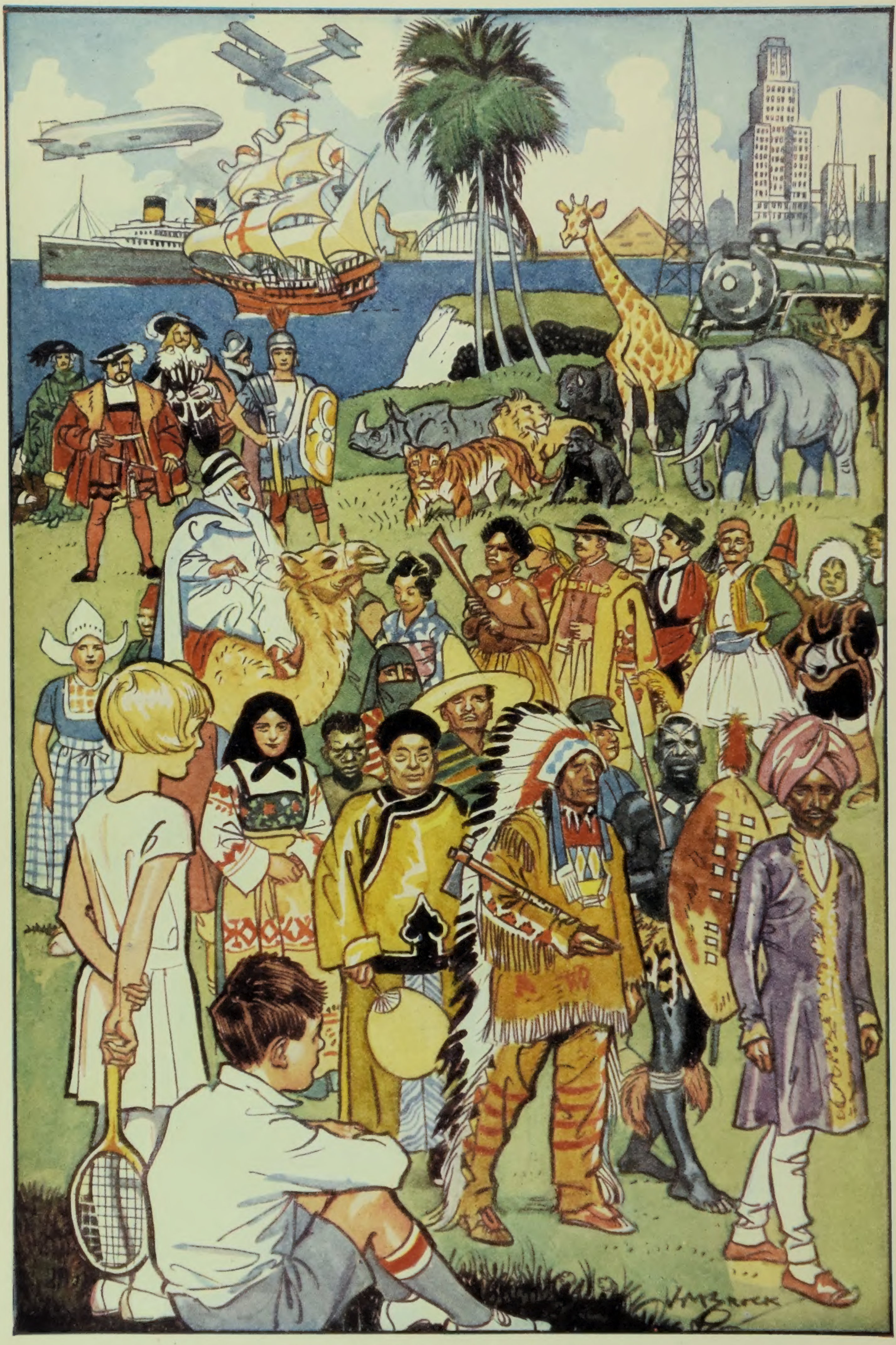
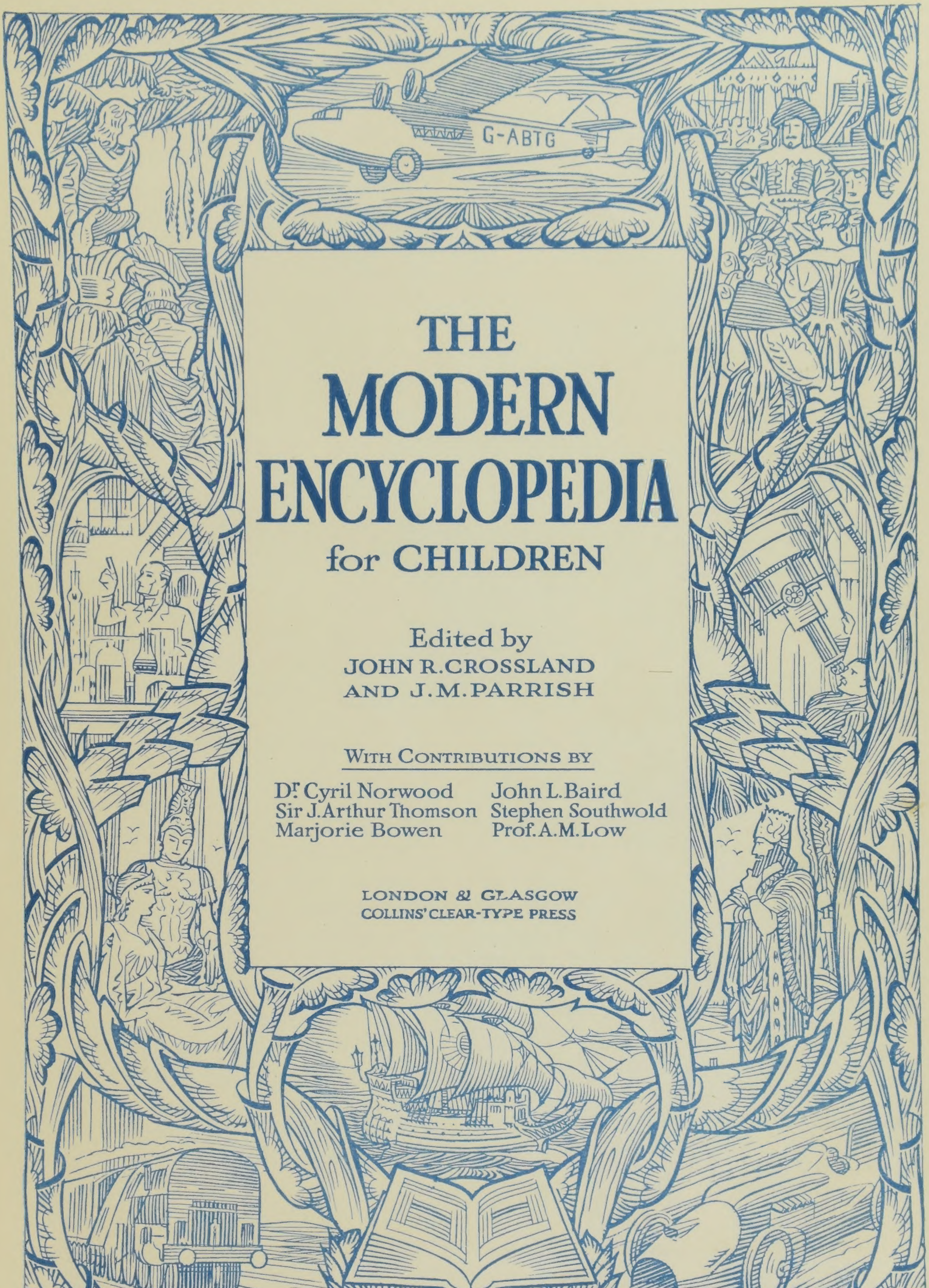


THE WONDERFUL PAGEANT OF LIFE.

The colourful wild life of jungle and plain, people and things historical and of to-day—all these are in this book. Modern wonders, stories, glimpses of art and music, games to play and things to make—these also join the procession of good things within the covers of this volume. [*Frontispiece*



THE
MODERN
ENCYCLOPEDIA
for CHILDREN

Edited by
JOHN R. CROSSLAND
AND J. M. PARRISH

WITH CONTRIBUTIONS BY

Dr. Cyril Norwood
Sir J. Arthur Thomson
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FOREWORD

By SIR MALCOLM CAMPBELL

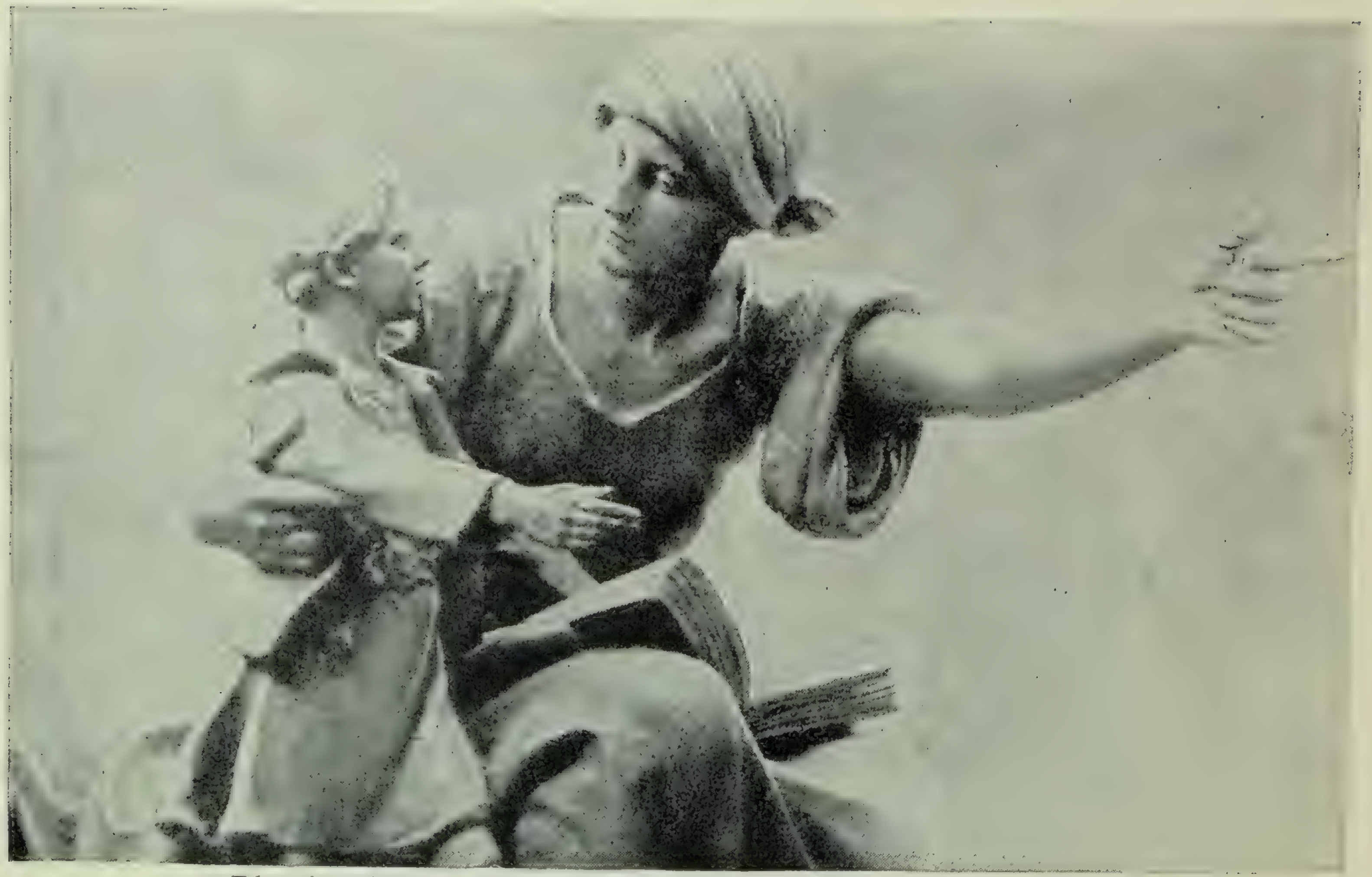
THERE is a saying which tells us that "Knowledge is power." That is most perfectly true, and I want all you fortunate youngsters who read this wonderful book to remember and to treasure that saying, because true knowledge is the key to all success in life. It does not matter what it is you aspire to do; you have got to KNOW, and the more you know the better you will succeed in whatever sphere of endeavour you have mapped out for yourselves. If you desire to excel in games, you must learn HOW, and the more knowledge you acquire of how and why others play them better than you and of the best methods leading to success, the more likely you are to achieve your ambition to excel.

And in the greatest of all games—that of your life's career—it is even more true that knowledge and experience alone can unlock the doors that lead to success. Of course, you cannot learn experience from even the best books. That you can only acquire as you pass along life's highway, but knowledge gained in advance will save you much bitterness and many failures while you are building up experience. If you start on your career with mind equipped with such a store of general knowledge as you can gain from books such as this, you will avoid very many of the dangers and pitfalls that beset that easy but unprofitable by-road of life which may best be called the Street of Ignorance.

Suppose, to illustrate the point I am thinking about, we take the motor car as an example. You all know what a motor car is. Most of you have ridden in one. But do you know exactly why and how it is that, for mile after mile and for months on end, the motor car runs as it does? Or do you know what has to be done to keep it in such order that at any time you can take it out, feeling certain that it will take you where you want to go and bring you back safely and without trouble? If you do, what a tremendous advantage it is to KNOW all this—of what may go wrong and of how to put things right when something happens. How you score over the lazy ones who have not thought it worth while to take the trouble to get that knowledge, which in this case is the power of which I spoke a few minutes ago! So it is with everything else in life. Unless you KNOW things you can never succeed in any enterprise you undertake. And nowadays there is no excuse for not knowing, when you have at hand such books as this to make your learning not only profitable but exceedingly pleasant. You may believe me when I tell you that very many of we older folk only wish we had had the same pleasant opportunities of getting our knowledge when we were at your age. Now, I think I have lectured you for long enough. I know you will find a great deal of pleasure in reading this book, and I am just as sure you cannot fail to profit very much if you take just a little trouble to store up in your minds what you have read. So good-bye and all good things to every one of you.

Sir Malcolm Campbell

Malcolm Campbell



Education—by Sir William Thornycroft, by permission of Lady Thornycroft.

TO THE BOYS AND GIRLS WHO POSSESS THIS BOOK

By CYRIL NORWOOD, M.A., D.Litt.

Headmaster of Harrow

THERE was an old Latin poet, called Juvenal, whom you probably have not read, and he wrote a line which might be the truth of this encyclopedia: *Quidquid agunt homines, nostri farrago libelli.* As perhaps you do not know enough Latin to translate this I will do it for you, " Whatever men do is the hotch-potch of my little book." But on second thoughts this does not seem suitable, for this encyclopedia is not a hotch-potch, and it is not a little book. What does suit it is the title " Whatever men do " and we might fairly add " Whatever men have done."

I expect that if you are intelligent and bright, you begin quite a lot of your remarks, when you are talking to older people, with those little words, Why? What? When? How? By all means go on doing it: it is one of the best ways of finding out the tons of things that you want to know. Only there is one disadvantage about it, or perhaps two: there are not always older people on the spot whom you can ask, and they do not always know the answer. That is just where this book comes in. Here it is, always ready to hand, an older person who knows more about everything than any older person that you know. Open the covers and ask.

For there is something here for every taste and every curiosity. When I look at the world as it is to-day and think of the world as it was when I was a boy, I realise that it has been very largely changed: and there is nothing more certain than that, when you are as old as I am, the world will have been changed all over again. If you ask me how it has been done, I can tell you that it has been done by modern science. But if you ask me again, as you probably will, When? and in what ways? I shall tell you to go to this book, and read about the march of science and electricity and the telephone and radium and X-rays, and so on. Then you will soon come to know how much has happened, and how quickly; you will also find out what a little time ago it was that men knew nothing about all sorts of things which you take for granted.

Dr. Cyril Norwood.
[*Photo : Claude Harris*

You may be interested in another branch of Science, in Natural History. There is certainly no end to what is to be learned there, but you can make a good beginning in this book. You can learn about yourselves too, for your own bodies are part of the kingdom of Natural History, an all-important part for you. Or again you may be one of those people who like most to read about what men have done in past days, and History is an exceedingly wide subject, by no means so dull as some of the schoolbooks make you think it to be. You will find a great deal here, about "Famous Fights" of former times, and about "People who have done Great Things"; and not only these, but others who are perhaps even more important, who have thought great things, and are the real shapers of human life. Here you can learn about literature and art, and something of the thoughts and ideals which makes us what we are. Or yet again—for here is a treasure-house to the end of which you will not easily get—you may be more interested in the Everyday Things about you, and you may like to know something more about the food you eat, and the clothes you wear, and the houses you live in, and how the things which you use are made, like books and all kinds of printed stuff. Well, you have only to look inside this book and see. Even if you were not attracted by any one of these things, but just like to do things and to make things, you can turn yourself into a very useful sort of person of a kind much needed in the world. And you can start by finding out from this book what sort of tasks you can try your hand at first—tasks which won't prove too hard.

There is another old Latin poet, whom we call Horace, who wrote: *Segnius irritant animos demissa per aurem quam quae sunt oculis subiecta fidelibus.* Luckily too difficult for you to translate, so this is what it means, "What comes in through the ear is not so sharp a spur to the mind as what is presented to our trusty eyes," or, quite briefly, "Seeing is believing." And this book is better than any older person, for it not only tells you, but it shows you, what the thing or the person looks like. One of its most excellent features is that it has so very many good pictures. On every page you can see what the writers are talking to you about, and, because you can see, you can understand at once.

So here is the book: open it and enjoy it.

Cyril Norwood

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OUR PLACE IN THE UNIVERSE

By Prof. A. M. LOW

Professor Low is a scientist and inventor of great repute. He invented the audiometer for the photography of sound and was a pioneer of television. During the great war of 1914-18 he invented the wireless controlled torpedo and many secret patents. In this introduction to the portion of our book that deals with other worlds and the growth of our own, he speaks of the immensities of space in the universe and of our short period on earth.

THE first sign of a child's intelligence is an appreciation that the world is not bounded by the walls of a nursery. A baby very soon realises that parents, brothers and sisters, are not the only people in the world.

In a sense, all human beings grow up in the same way every year. Hundreds of years ago, our ancestors believed that "the world" consisted of what we now know to be less than a continent. Later, they thought the earth, the sun and the planets represented the whole of creation. Now we believe that the solar system is but a very small part of creation, and that the extent of the universe is quite unknown. The oldest and wisest scientist would readily admit that there are probably worlds of which he has no knowledge and which he cannot even picture in his mind.

Prof. A. M. Low.

During recent years when microscopes and telescopes have become increasingly powerful, our knowledge of the bigness and smallness of created things has become almost frightening. But as soon as a little of the working of this universe is understood, it seems no longer frightening, but very wonderful and much more beautiful than any fiction.

By examining rocks upon the earth, we are able to guess that men have existed for hundreds of thousands of years, while the earth itself is about 2000 million years old. For millions of years it was merely a fiery mass, like a small sun. The coming of life was followed by more millions of years during which man was evolved from simple forms of life. Even when, hundreds of thousands of years ago, man in something like our own likeness came into existence, a very long time had to pass before he became intelligent.

During all but the last three hundred years of this recent period, men regarded the world as the centre of creation. The first men to suggest that this globe was not, perhaps, the most important of the many heavenly bodies were regarded as harmless lunatics or dangerous revolutionaries, attempting to dethrone Man from his supreme position!

Since it was first realised that the sun is the centre of the solar system, and that this earth is only a fragment flung away from a large and very hot star, our ideas of our place in all creation have undergone a great change. We believe now that the solar system is only a small part of what we call the universe, which contains many other stars, far larger and hotter than our sun. We also believe that possibly other equally large universes exist beyond our own.

To grasp some idea of the place of man and the earth in space, try to imagine the universe as a map. Towns perhaps a few hundred of miles apart are shown as black dots only an inch apart on some maps of the world. Usually the scale of a map of the world is one in a hundred million—that is, two towns about 1500 miles apart are an inch apart on the map. If we had a map of the universe on this scale, the sun would be a mile away from the earth and it would look as big as a church!

A very large map would be needed for the solar system and a whole continent would be covered by one of even the smallest parts of the universe. The nearest " fixed star," which has the unromantic name of Alpha Centauri, is about sixteen billion miles away ! When we begin to explore the universe, distances become so tremendous that we have to abandon ordinary measures, like yards and miles, and speak in terms of " light-years," that is, the distance light travels in one year.

Light travels at a tremendous speed—it takes only 1-186,000th part of a second to travel a mile and in a year it covers five and a half billion miles ! If the sun were suddenly to go out like a candle, we should not know anything about it for eight minutes and, in spite of the great speed of light, if Alpha Centauri were to disappear into space to-morrow, the newspapers would not be able to tell us the news for three years !

But Alpha is a next door neighbour compared with some of the other stars. The most remote star seen in the most powerful telescope is 140 million light years away—that is to say, the pin prick of light seen in the telescope left the star 140,000,000 years ago—long before man appeared on the earth.

As the telescope has enlarged our horizon outwards, so the microscope has increased our knowledge of little things. We hear a great deal of talk about atoms, for instance, but how many people realise that there are millions of billions of atoms in an ounce of hydrogen—and your body contains many ounces of hydrogen. You must seem as big to an atom, as the universe seems to you !

Now we are coming to even smaller things. We know that atoms themselves are made up of smaller particles, and it seems as if we shall eventually find each atom is in itself a solar system, or perhaps a universe !

To know about the place of man in creation makes life very much more interesting. It might have been self-satisfying to our forefathers to think that the sun shining in the sky was the greatest sun in existence, especially placed there for their benefit. But it is more wonderful to know that the whole universe we can see on a clear night is only a small part of creation and that even the full stop at the end of this sentence contains millions of atoms, each one of which is, perhaps, a universe in itself.

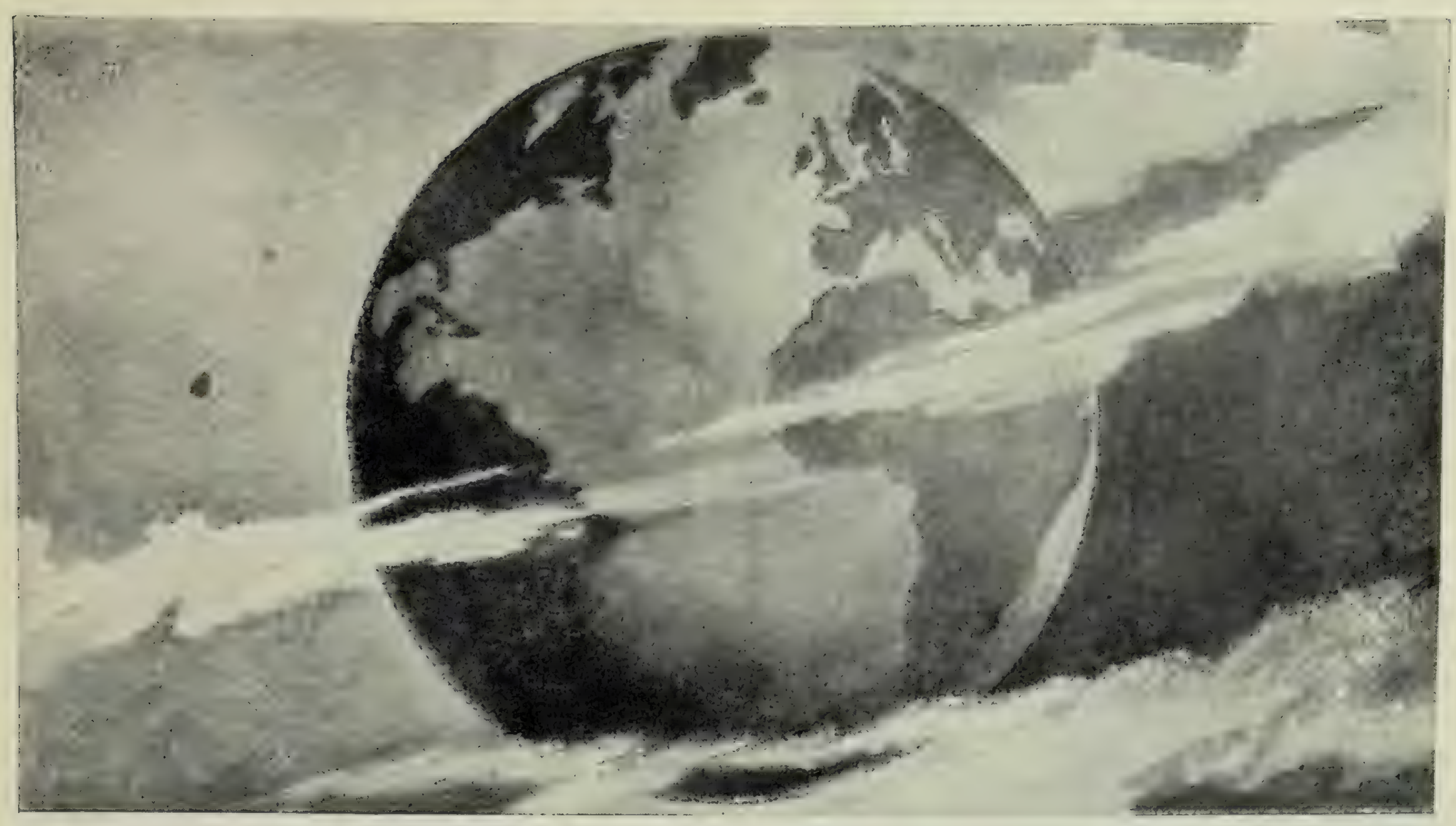
To observe and to think about the latest discoveries of science, and the manner in which they can affect us, makes ordinary things like puddles of oil in the road more beautiful. We can measure the thickness of the oil film producing the colours in thousands of an inch, just as we can measure the heat falling on the earth from stars billions of miles away.

Man has now been living on this little earth probably for some two or more hundred thousand years. Scientists suggest he will continue to inhabit the earth for at least another million million years ! If we reckon the whole period of his existence as seventy years, then he is still a new born infant, only just guessing that there are other people in existence besides his mother ! And all our great discoveries have been made, again speaking comparatively, during the last few seconds !

We should realise how wonderful it is that we have been selected for this moment—the moment of awakening. This thought alone should make us want to know everything, to be thirsty for knowledge about ourselves and our amazing past.

The greatest discoveries of science are that we have all very little knowledge, but that our bodies, our largest buildings, and everything we see, are subject to everlasting change. It is only by thinking of the wonders of existence and by observing the happenings of every day life that we can hope to make progress.

Never be prejudiced, try always to remember the scientists' motto that " what is good enough for to-day is not quite good enough for to-morrow."



If we were able to stand on the moon and view our world hanging in space it would appear something like this.

OUR GREAT UNIVERSE

WONDERFUL WORLDS THAT FLY THROUGH SPACE

We on earth are minute specks in a great universe of worlds. We watch the moon and stars, and note how constantly the sun seems to rise and set. Then we are filled with a great wonder and with a desire to know more of the worlds beyond and of the earth on which we live. This book will try to tell something of these things. Here, in our opening chapter, we shall learn of the sun, moon and the stars. We shall learn why they twinkle and why some are brighter than others.

WHEN we look up at the sky on a clear night, one of the thoughts which come to us is, how did the stars begin ?

Not so very long ago people thought that the stars had always been there, that they had had no beginning, and would have no end, but nowadays we know that the starry universe is subject to the laws of birth and death, just as are all living, earthly things.

How did the first stars come ? Perhaps at one time the universe was a vast cloud in the form of gas which in the course of countless ages collected and condensed at various points into more solid form, and so became the first stars. This, however, is merely a guess. No one can answer that question, but we do know that there are in space at this moment thousands of such gaseous clouds which are probably suns and worlds in the making.

These clouds of gas are called nebulæ, and many of them are so huge that the whole of the star world would cover but a tiny portion of their immensity. Some of these nebulæ are mere shapeless clouds of vapour, others have a definite spiral form like a catherine wheel, and it is from these spiral nebulæ that new worlds and starry universes will probably come.

There is no time in space. A million years are as one, and countless ages must pass before these clouds of gas shape themselves into suns and worlds. Yet all the time the great process of birth is going on. Astronomers believe that the spiral nebulæ are all in motion, each one revolving round a central point or nucleus, and as they revolve the force of mutual attraction causes the particles of gas to collect together at various points, until gradually bodies of more solid matter are built up in the hearts of the nebulæ. And as these bodies condense so they become hotter and hotter until at last they shine forth as stars.

The great spiral nebulæ which dot the heavens are probably whole universes of stars in the making, but there may be millions of smaller nebulæ which are invisible even in the most powerful telescopes. From some such nebula our own sun was probably born.

BUT even now we have only answered half the question. We have seen how new stars may be formed, but we have still to learn where the nebulæ come from. Are new nebulæ being formed? It is thought that they are. Nothing ever stands still in space. Everything is moving. Stars are born and stars die, and as we know that there are millions of stars still bright with life, so there must be countless numbers of dead stars, black, invisible masses of solid matter from which all heat has fled, hurtling through space at tremendous speeds. And is it not possible that, even in the immensity of space, two dead stars, or a dead star and a live star, may sometimes meet in collision?

Imagine such a collision, imagine two immense masses meeting head on. The impact would be so terrific, and the heat produced so immense, that the stars would instantly dissolve into clouds of gas. This in the course of time would probably begin to revolve until a spiral nebula was formed, and the stage was set for the birth of new suns and worlds.

The Orion nebula. This is a bright mass, and therefore may be young as compared with other heavenly bodies. A nebula such as this is a birthplace of stars, and here, as may be gathered from the sweeping curves of the light masses, great forces are ever at work.

It is not even necessary that the two stars should collide head on to form a spiral nebula, indeed, a spiral nebula would be formed more quickly if the bodies merely grazed each other. In such a meeting the heat caused by the friction would be so intense, and the mutual attraction of the two bodies upon each other so great, that the stars would be rent asunder into countless fragments which would take the spiral form revolving round a central nucleus.

Sometimes in the depths of space where no star is, or only a very faint star, there will suddenly spring into sight a star of surpassing brilliancy. For some months the star will burn with unrivalled splendour; then gradually the brightness will fade until the star becomes invisible to the naked eye. But, looking through their telescopes, the astronomers will see that where some time before there had been only a very faint star, or no star at all, there is now a star surrounded by a nebula. Several of these new stars have blazed forth in the last century, and it is wonderful to think that, far out in the depths of space, two stars may have met, and by their mutual destruction have formed the matter out of which in countless ages to come new suns and worlds will be born.

JUST as our sun is a star so are all the stars suns, many of them immeasurably bigger than is the great sun itself. These distant suns are in all probability centres of world systems like our own. Unfortunately, with the exception of the planets of our own solar system, we cannot see these other worlds. The stars shine by their own light, but these myriad worlds of space have little or no light of their own, and the most powerful telescope cannot make them visible to the human eye. Yet they are surely there, and may be shedding light and warmth on living creatures as does our sun on us.

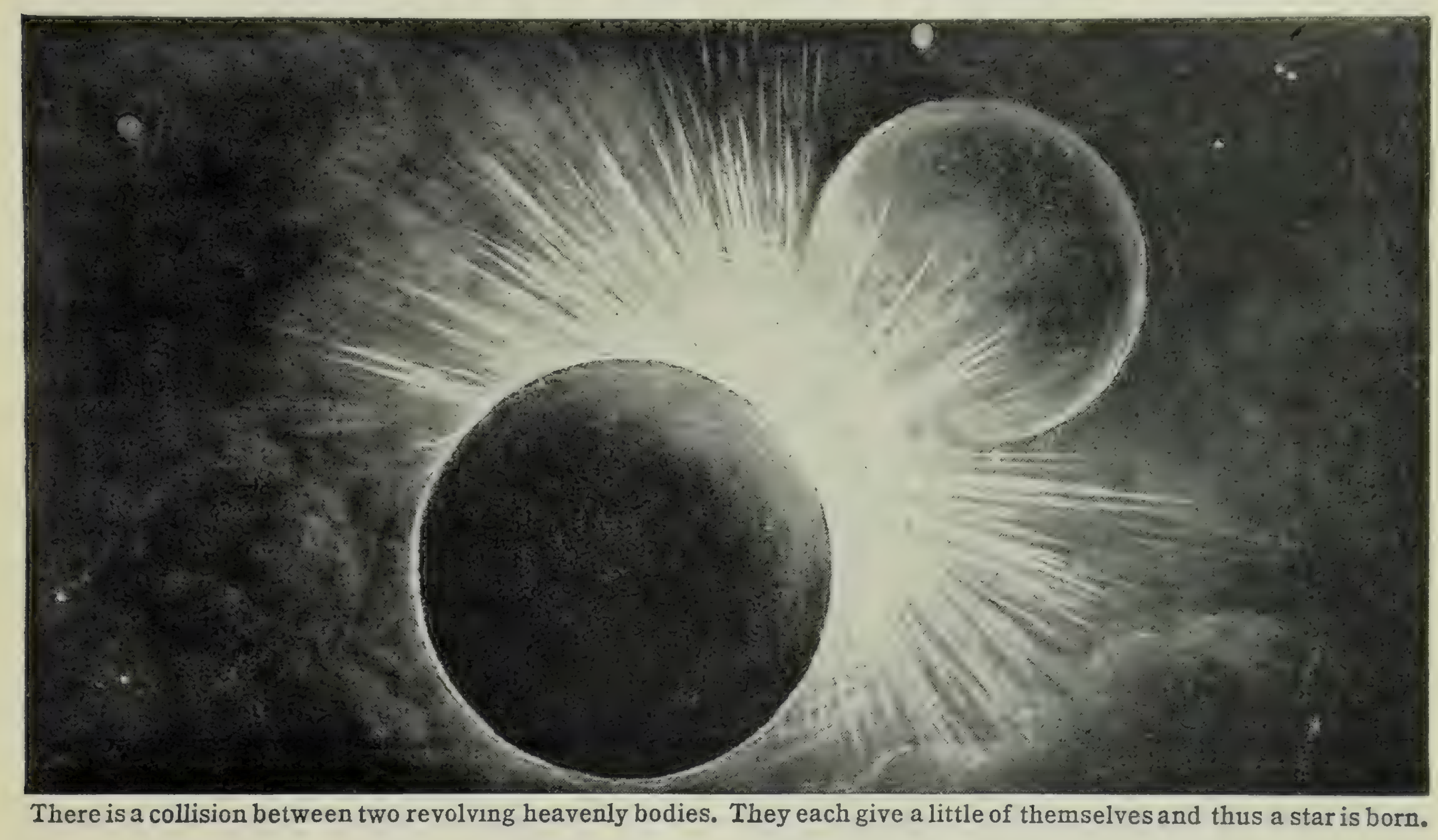
HOW MANY STARS CAN YOU COUNT IN A CLEAR NIGHT SKY?

No one knows how many stars there are. With our unaided eyes we can never see more than about 2500 on a clear night in England.

This is strange, is it not? We imagine we can see millions; yet all the year round there are probably not more than 4000 stars which are visible to our naked eyes. But so great is man's ingenuity that he has invented telescopes which can increase this number to more than 1,500,000,000, and beyond these there are millions more out of sight.

MILLIONS of suns; yet so immense is space that our nearest star is twenty-five million million miles away, and light, which travels at 186,000 miles per second, takes four and one quarter years to travel from this star to our earth. Millions of millions of miles! We cannot imagine such distances; yet this star is near compared with most of the suns of Heaven. So distant are the greater number of stars that astronomers do not attempt to record their distances in miles, for we could not comprehend the rows of figures which would result. So they have adopted another system of measurement. Instead of saying that a star is so many trillions of miles away, they say that its distance from the earth is so many light-years. This means that light, which travels 5,876, 068,880,000 miles in a year, takes so many years to reach us from any particular star. Thus the light by which we see our nearest star left that star four and a quarter years ago. Other stars are 30,000 light-years away. There are stars, visible in our powerful telescopes, which are so far away that the light which is reaching us at this moment set forth on its journey across space at the time of the Battle of Hastings, or when Julius Cæsar was invading Britain, whilst one cluster of stars is estimated to be no less than 108,600 light-years distant from the earth.

How serene the sky looks on a fine night! The stars hang motionless in the purple sky. We see them almost exactly as the ancient Greeks or Romans saw them. The stars which they grouped together in constellations still occupy very nearly the same relative positions to each other as they did two or three thousand years ago. Yet the stars, which seem so still, are, in fact, hurtling through space at enormous speeds. The myriad suns of Heaven are never still. Each one is rushing along its separate path; yet so vast is space, so immense the distances which separate our world from the stars, that the stars seem to be quite still, and a man would have to live hundreds of years before he would begin to notice any change in their positions.



There is a collision between two revolving heavenly bodies. They each give a little of themselves and thus a star is born.

SO far, we have only watched the stars from a distance. Now let us examine them through a powerful telescope. Instantly a wonderful thing happens. Instead of seeing only white or yellow stars, we see the sky peopled by suns of every imaginable hue. There are green suns and red suns, purple suns and blue suns, orange suns and suns shining with dazzling whiteness. Why are they of different colours? No one knows for certain, but the colour of a sun may in many cases have something to do with its age. A new sun is probably red, and gives out relatively little heat. So it shines for countless centuries ; yet all the time the particles of which it is formed are being drawn together by mutual attraction, so that the new sun slowly contracts and grows smaller. And as it contracts it grows hotter, and from a red sun it becomes an orange sun, and so on until it is a dazzling white sun giving forth immense heat. But from now on it starts to grow old. The sun goes on contracting, but no longer does its heat increase. Instead, the sun begins to cool, and from a white sun it becomes an orange sun, and so on until at last it is a red sun again. But now it is immeasurably smaller and more solid than when it was born, and no longer does it hold within itself the germ of life. Slowly but surely that red sun will die.

SUNS OF ORANGE, GREEN AND BLUE, THE BEAUTIFUL RAINBOW TINTS OF THE STARS.

Another wonderful thing which the telescope shows us is that, unlike our sun which seems to us to fly through space in lonely splendour, there are families of suns, where two, three, or more stars revolve round each other in space. These families are known as double, triple or multiple stars, because to the naked eyes they appear as one single star, and some of them are very beautiful indeed. One fine triple star is composed of three suns, the first of which is orange, the second green, and the third blue. What marvellous colour effects there would be on a world lighted by such suns ! As the orange sun sank the distant horizon would be tinged with green, and the green sun would rise, and shed its light over the world. So for a few hours the world would be bathed in an emerald glow ; then up would spring the blue sun to mingle its sapphire rays with those of its companion star. But soon now the green sun would be sinking, whilst behind it a golden glow would herald the rising of the golden sun again. In such a world there would probably be no night, but in its place a wonderful interplay of coloured lights.

But all the worlds of space are not so fortunate as this imaginary world. Our sun always gives the earth the same amount of heat year after year, century after century, but there are suns in the heavens which wax and wane, at one time giving out vast quantities of light and heat, at other times fading away until they are but dim shadows of their former splendour. Such stars are called variable stars. Probably they are suns in the last stages of old age, and, as a dying fire will flicker up, so the molten interiors of these dying suns may periodically burst through the shell of thick vapour which is forming round them, and for a short time the sun will blaze forth with something of its youthful glory.

It would not be very pleasant living on a world lighted by such a sun. For some weeks we should bask in glorious golden sunshine, then suddenly the light would begin to fade, and the bright sun would grow darker and darker until it was nothing more than a dull red orb giving forth little light and heat. So for some months we should live in perpetual twilight, then the sun would begin to grow bright again, until once more it was shining forth in golden splendour, only in the course of a few weeks to sink again to a dim, red globe.

Thousands of years ago the ancient astronomers saw that the chief stars were clustered together in groups. These groups we call the constellations. The stars are not related to each other, they are countless miles apart, but in the figures they form the ancients saw the heavenly embodiment of their gods and heroes, and the names they gave to these constellations have come down to this day.

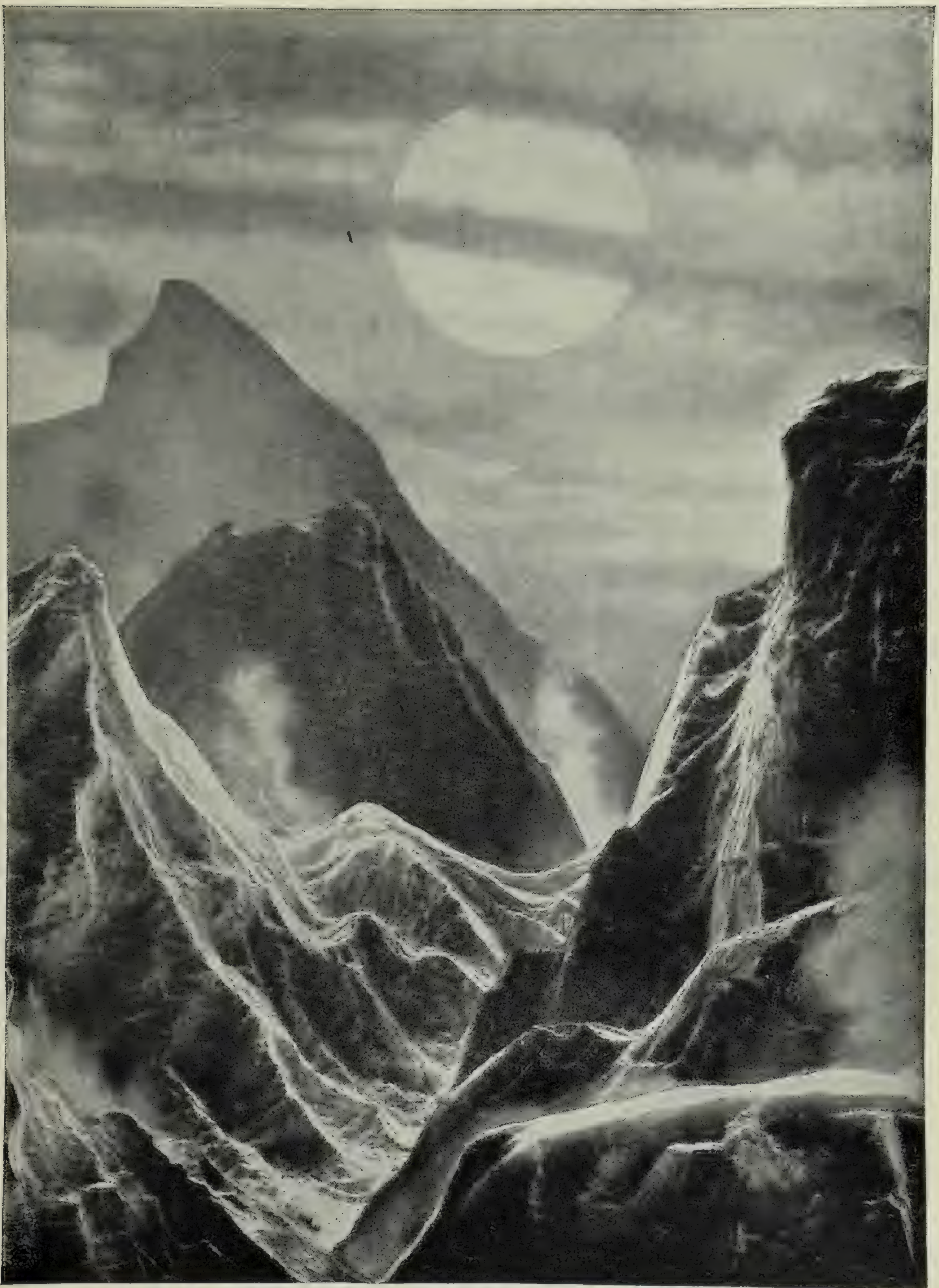
Some constellations are visible all the year in our northern sky. Others appear only for a part of the year, rising and sinking above the horizon according to the season, whilst some southern constellations are never visible in the northern hemisphere.

To pick out the chief northern constellations we must start with the magnificent group of seven blazing suns called the Great Bear. Four thousand years ago the Chinese regarded this wonderful constellation with veneration, and to-day it is still the most conspicuous group of stars in our northern skies. The Great Bear is always visible. No matter what the season may be, provided that the night is clear, we have only to turn towards the north to see its seven great suns blazing down upon us.

THE SIGNPOST OF THE SKY, AND STARTING PLACE FOR EXPLORATION.

Having found the Great Bear, we can embark on our voyage through space. Let us look at the two stars which form the extremity of the Bear's body, and from the lower draw an imaginary line through the upper, and prolong it for a distance roughly equal to the length of the Great Bear, and we shall come to the most important star in the northern sky. This is the Pole Star, and forever it hangs immovable over the earth's northern pole, and round it all the stars of the northern hemisphere appear to

GLOWING MOUNTAINS ON RED-HOT MERCURY



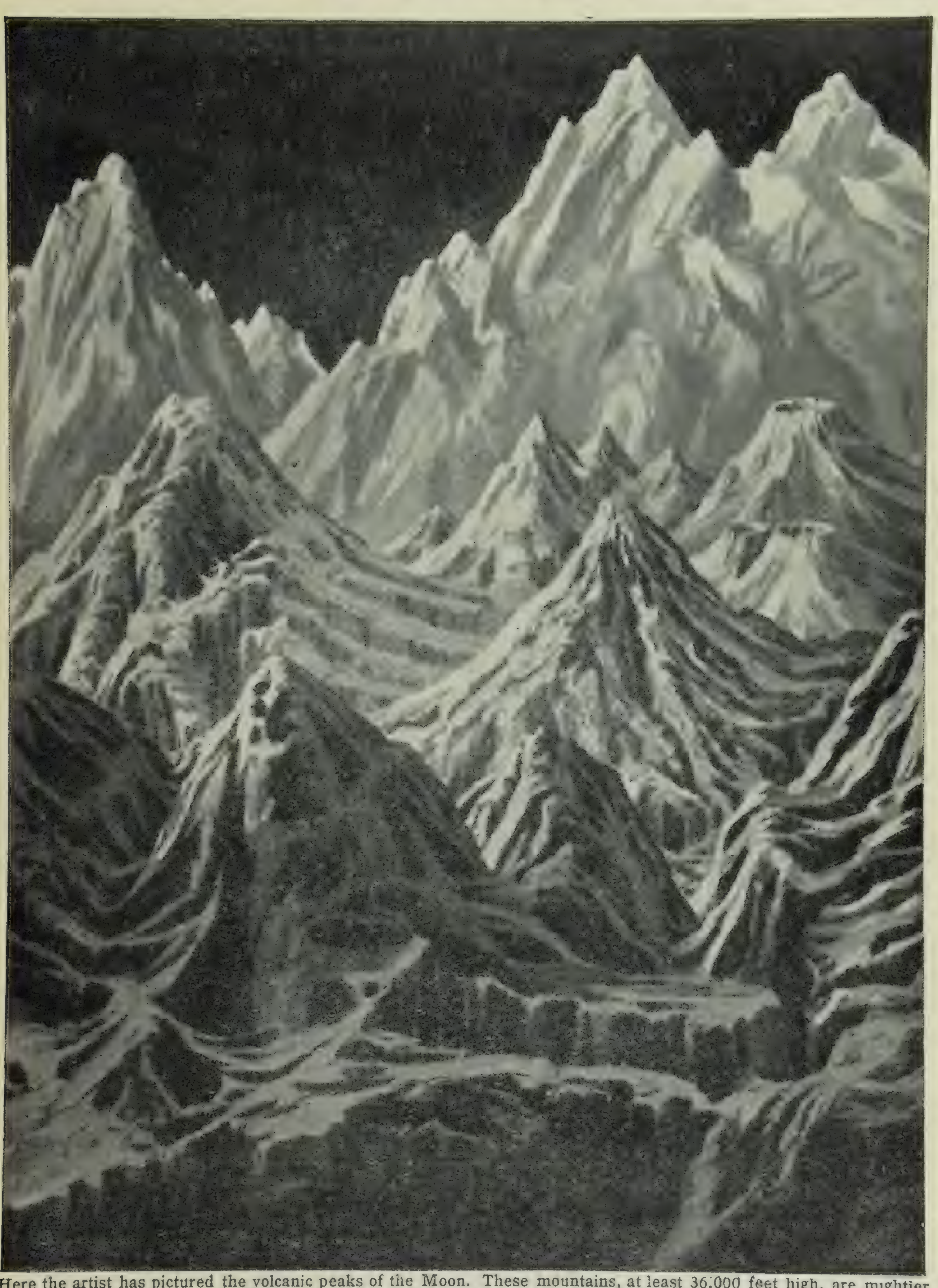
An astronomer who was also an artist drew this picture to show what it must look like on the planet Mercury. Here the poles are the hottest part, and the equator the coolest. It is said that the barren rocks are so hot that even tin would melt if placed upon them. [*London Electrotype Agency*

A DEAD PLANET WITH A FEARSOME SURFACE

Here is a wonderful photograph of the moon, taken through a telescope, The moon, the night-light of the world, is a barren globe covered with huge craters, as though at one time in its life it was filled with volcanoes in eruption. [*Topical*

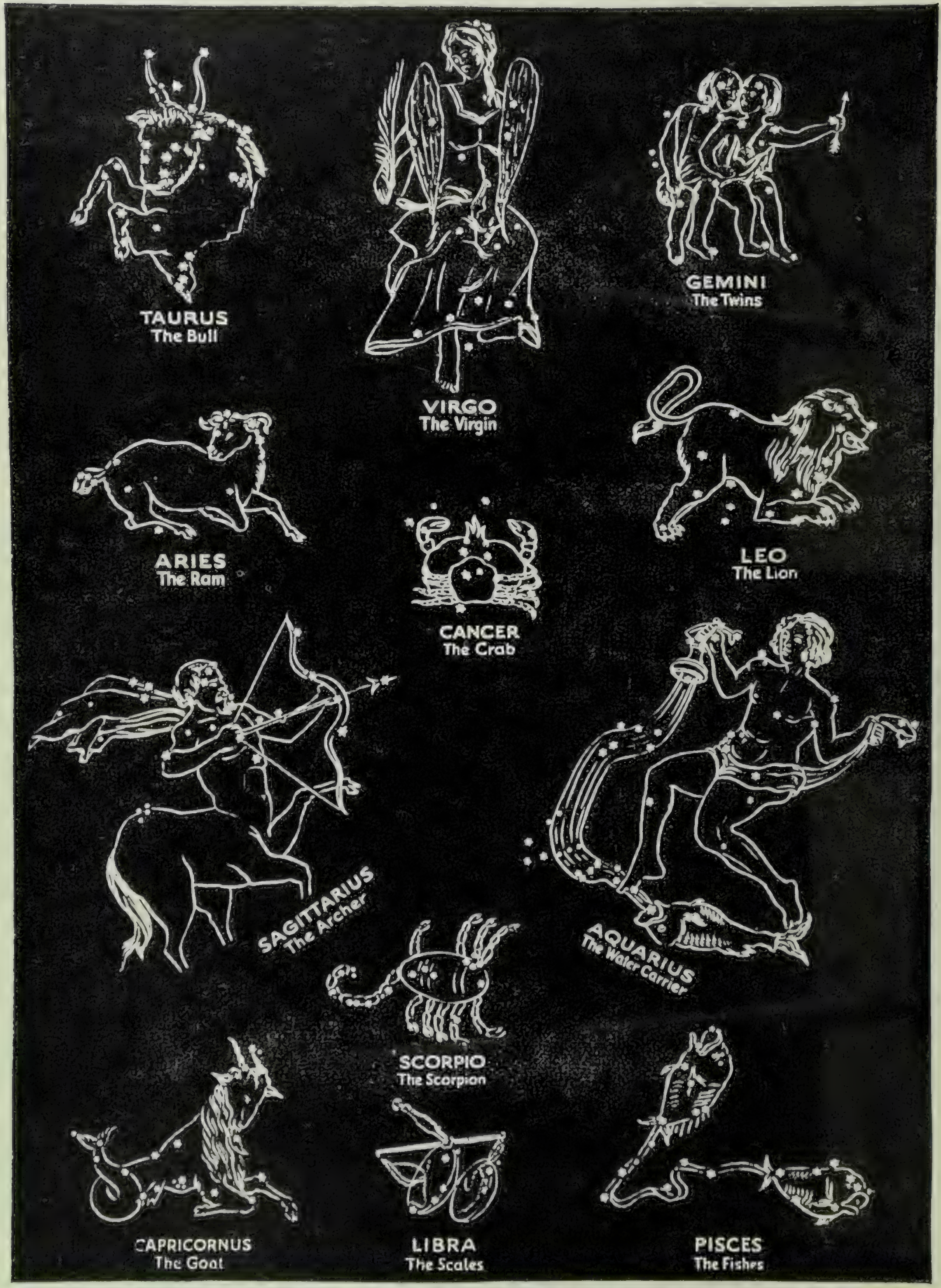
This remarkable photograph brings us nearer to some of the gigantic craters of the moon. The shadows they cast show that these dead volcanoes are of great height. The photograph also shows how barren and deserted is this dead world. [*Topical*

TOWERING PEAKS ON THE MOON'S SOUTH POLE



Here the artist has pictured the volcanic peaks of the Moon. These mountains, at least 36,000 feet high, are mightier than any on our earth. The peaks are covered with ice, hoar frost and snow, while in the valleys and crevasses there seems to be fog. Some astronomers think, therefore, that there may be some air in the deep valleys. [*London Electro. Agcy.*

THE TWELVE SIGNS OF THE ZODIAC


TAURUS
The Bull
VIRGO
The Virgin
GEMINI
The Twins
ARIES
The Ram
CANCER
The Crab
LEO
The Lion
SAGITTARIUS
The Archer
AQUARIUS
The Water Carrier
SCORPIO
The Scorpion
CAPRICORNUS
The Goat
LIBRA
The Scales
PISCES
The Fishes

The word Zodiac means "little animals." If you look at the picture above you will see why. This belt extends all round the sky and has as its middle line the great circle along which the Sun journeys during the year. The twelve figures seen above mark the leading constellations of the Zodiac. The naming of these stars was probably the work of ancient Babylonian astronomers, who gazed up into the sky and fancied they saw forms of animals there.

circle once in every twenty-four hours. When we look at this star we are facing north, the south is behind us, the west on our left hand, and the east on our right.

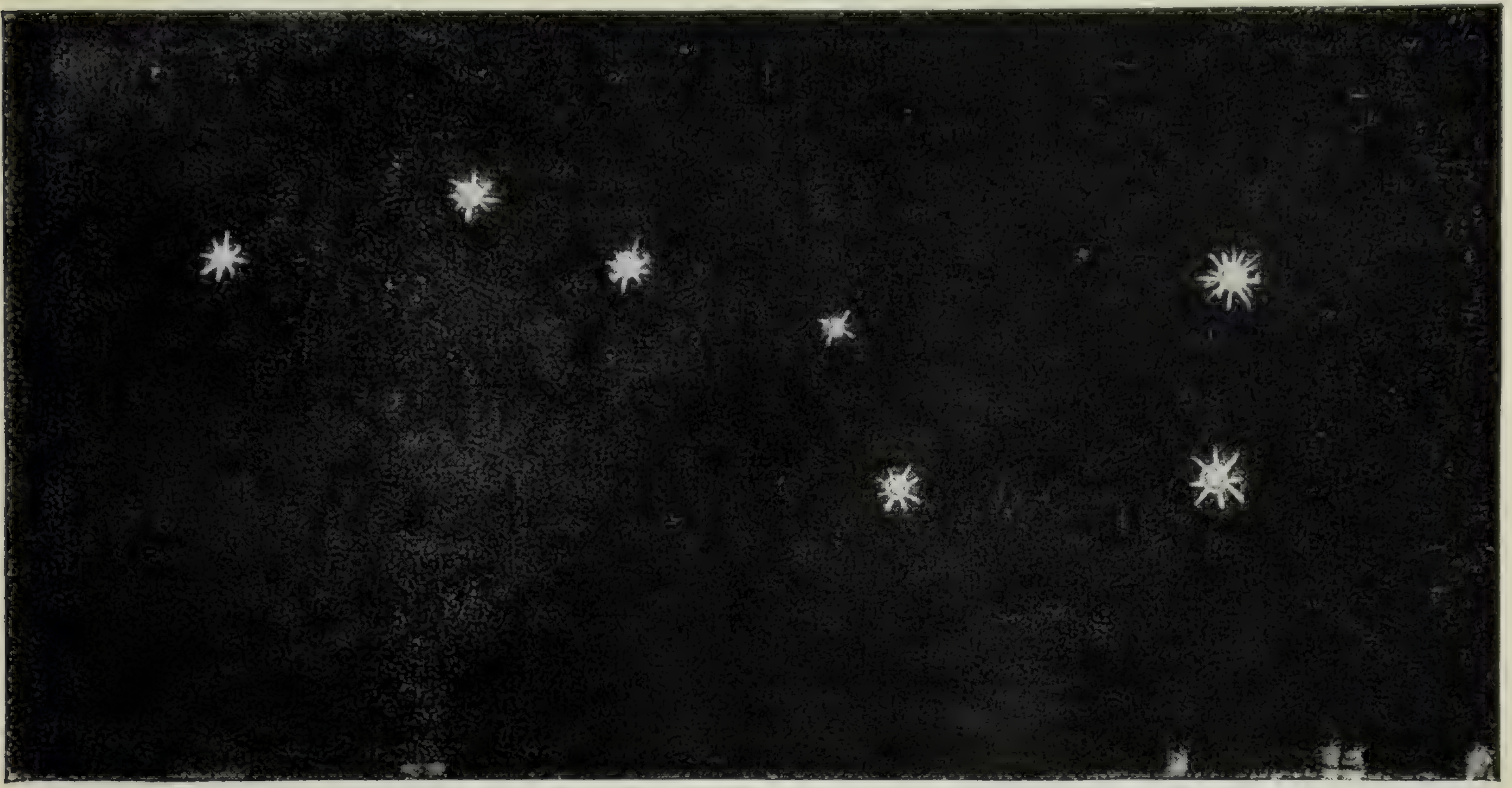
THE Pole Star will lead us to the next constellation, the Little Bear. The Little Bear is like the Great Bear in shape, but smaller, and the Pole Star is the first star in the Little Bear's tail. To the ancient Greeks these constellations were the starry embodiment of a Greek nymph, Callisto, and her little son, who were transformed into bears by the Goddess Juno in a fit of rage. Later, Jupiter set them in the sky to shine forever as the constellations of the Great and Little Bear.

Let us return to the Great Bear, and from the star at the corner of its body nearest the tail run another imaginary line through the Pole Star, and straight on across the sky. Soon we shall see a group of five stars shaped like the letter W. This is the constellation of Cassiopeia, the mother of the Greek heroine, Andromeda, who was chained to a rock and left to be devoured by a great sea monster. But just in time the hero Perseus arrived on his winged horse, Pegasus, killed the monster, and carried Andromeda away to be his wife.

Now if we continue the straight line which led us to Cassiopeia, we shall, in autumn and winter, come upon a magnificent constellation of four stars forming a great square. This is the constellation of Pegasus, the winged horse.

Andromeda is also close by. If we start from the star which forms the corner of Pegasus nearest to Cassiopeia, and follow a curved line round the base of Cassiopeia, we shall pass through three other stars which are named after the beautiful Greek maiden. Still following our curved line we come almost at once to a constellation of six stars. This is the constellation of Perseus, Andromeda's husband.

You will have heard of Atlas who was supposed by the Greeks to support the heavens on his shoulders. Atlas had seven beautiful daughters, and one day as the girls were strolling through a forest they were pursued by the young hunter, Orion. With cries of fear the girls fled, but Orion gained upon them rapidly, and he was about to overtake them when the Goddess Diana changed them into seven white doves which later she set in the sky as seven stars. If you look below Perseus, you will see a faint group of stars. These are the Pleiades, the daughters of Atlas. There are only six stars in the Pleiades, the seventh, so legend says, was so grieved at the capture of Troy that she faded away and became invisible.



The seven blazing lamps of the Great Bear, also known as The Plough, and Charles's Wain. The two stars on the right point to the Pole Star.

IF we now return to the Great Bear, and continue the curved line of its tail, we shall come to a beautiful golden star. This is Arcturus, and it forms part of a constellation of five stars called the Herdsman. This constellation is shaped like a kite with Arcturus at the bottom, and almost resting upon its left-hand shoulder is a half-circle of seven bright stars. This is the Northern Crown.

Orion, the hunter, is also in the heavens. He is visible in the northern sky in the early part of the year as a great parallelogram of four magnificent stars, with three others stars in the centre which are known as Orion's Belt. Orion is accompanied on his everlasting journey through space by his faithful dog, Sirius. Sirius is a brilliant star slightly below Orion to the left. It forms part of a constellation known as the Great Dog.

WHY DOES THE SUN SHINE SO BRIGHTLY AND GIVE US WARMTH?

What a wonderful place the sky is, peopled by all these mythological heroes and heroines in the shape of beautiful constellations of stars. Some of them are even mentioned in the Bible. In the Book of Job you will find the Prophet referring to Orion and the Pleiades, and the Book of Job was written 2500 years ago.

The sun is a very good friend to our world, nevertheless, it could be a very terrible neighbour, and only the distance which separates the earth from the sun, and the fact that the thick envelope of air round the earth tempers the sun's heat, prevent us all from being scorched to death.

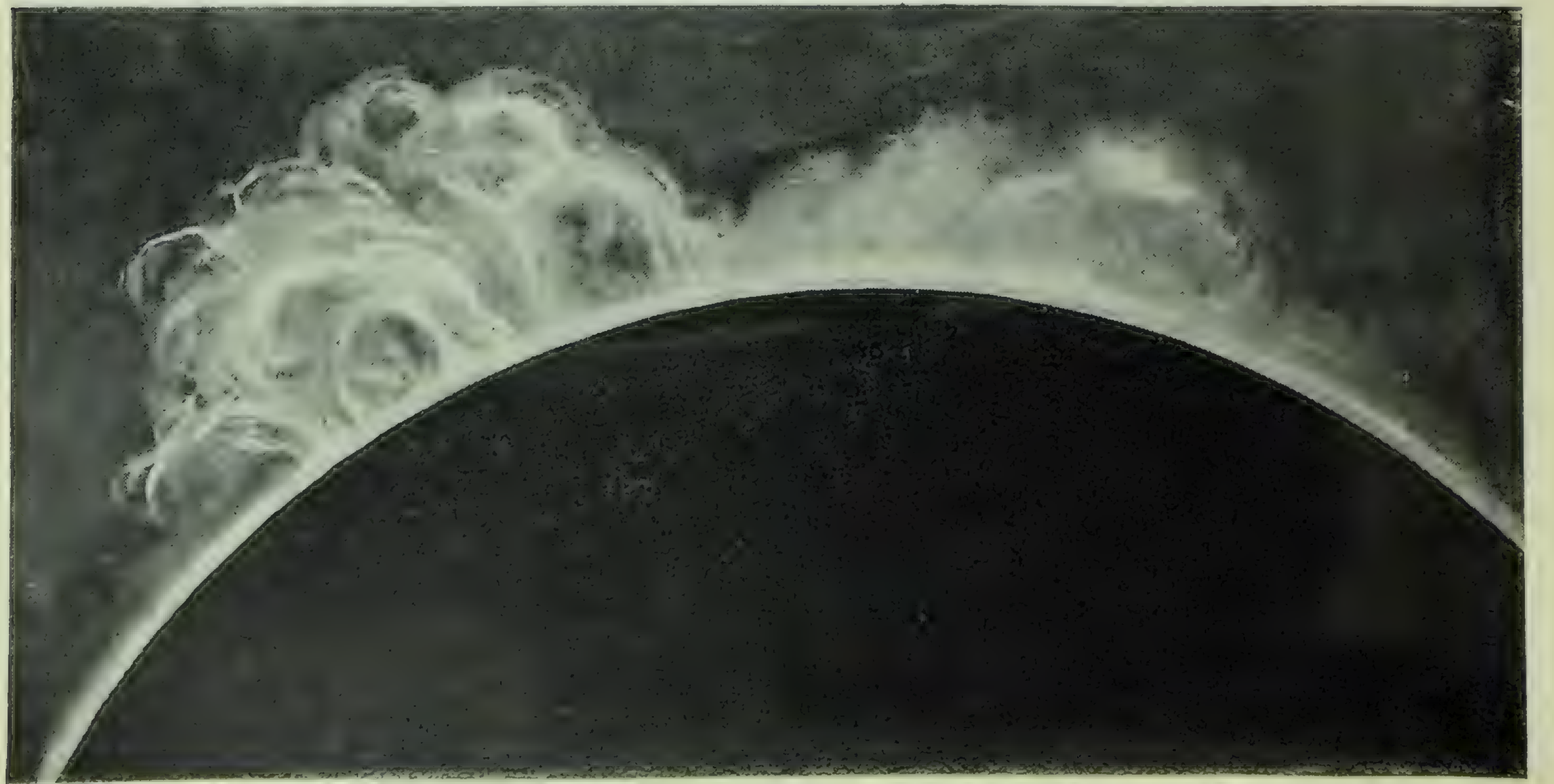
Our earth seems a big place, but it is tiny compared with the sun, which is 1,280,000 times vaster in volume, and 324,000 times heavier than our world. The sun has no solid outer shell like the earth, and though to our naked eyes it appears so peaceful, seen through a telescope it becomes a seething mass of fire and swirling gases, a place of frightful storms and appalling volcanic eruptions far worse than any experienced on earth.

Let us imagine we can go to this flaming star. Long before we have crossed the 93,000,000 miles of space separating the earth from the sun we shall come in contact with the sun's outermost region. This region is called the *corona* or crown, and stretches out from the sun for millions of miles into space. Seen from the earth, the corona has the appearance of soft, silvery light, much of which is probably sunlight reflected upon innumerable particles of dust.

So far we have found nothing very terrible, but now there appears before us a vast, raging sea of crimson fire out of which tongues of flame are shooting up into space with frightful velocity for thousands upon thousands of miles. Some of these flames travel at the rate of 60,000 miles an hour, and reach the prodigious height of 500,000 miles above the sun's surface, and were our earth placed in one of them it would be burnt to a cinder before we knew what was happening.

WHEN IS IT POSSIBLE TO SEE THIS CRIMSON SEA OF FIRE?

This terrible second region of the sun is called the *chromosphere*, and is between 5000 and 10,000 miles in thickness. It is composed of flaming hydrogen and other gases, and is invisible to the naked eyes, because the dazzling light which comes from the inner body of the sun obscures it from sight. It becomes visible, however, through a telescope during a total eclipse of the sun. Then the dazzling light is cut off by the body of the moon, and the observer can see the vast,



The roaring flames rising from the sun. The world on fire would be a mere flicker compared with this burning fury.

crimson flames of the chromosphere licking out into space.

And now, at last, we are nearing that part of the sun we can see every day, the part which gives us light. Passing through the chromosphere, and another layer of luminous gases immediately beneath it, called the *reversing layer*, we come to the *photosphere*. This is a dazzling layer of brilliantly luminous vapour, the light from which floods out across millions of miles of space, lighting up our earth, and the moon, and all the other planets of our family of worlds, and even travelling farther still to other worlds, belonging to other suns.

HOW DO WE KNOW THE SUN REVOLVES ON ITS AXIS, AS DOES THE EARTH?

Though the photosphere looks so calm it is, in reality, in a state of violent turmoil. The heat of the sun is so intense that nothing solid could possibly withstand it. The hardest metal would immediately be turned into gas, and the photosphere is probably a boiling ocean of white hot metal vapour. The photosphere is also the seat of appalling outbreaks such as have no earthly parallel. From time to time dark spots appear on its brilliant surface. These sun-spots, as they are called, look like great cavities in the photosphere, and are sometimes of such immense size that our earth could easily be dropped into one of them. Huge flames shoot up round the edges of these spots, and round and over them streams of glowing vapour whirl violently as though driven by some terrible blast of scorching wind, giving to the spots the appearance of giant whirlpools in the boiling surface of the sun. Perhaps that is what they are, but nothing is known for certain.

From watching these spots we have, however, learnt one very interesting thing about the sun. The sun revolves on its axis in the same way as the earth does, but it does not all revolve at the same speed. A point on the sun's equator takes twenty-five days to make one revolution, whilst farther north or south a similar point will take twenty-eight days to arrive back at its starting point. This proves that the sun is not solid, for if it were so the period of going round would be the same on all parts of its surface.

Have you ever realised that without the sun this beautiful world of ours would be a black, lifeless waste? For countless centuries the sun has been giving out enormous quantities of light and heat, and for countless centuries to come it will continue to pour out these invigorating streams, a tiny portion of which is intercepted by our earth and turned into the *energy* which is life.

A star cluster in which there are over six thousand stars all gathering in an area less than that of our own earth.

There are two kinds of energy. There is the energy of motion such as that of water falling over a cliff. That is called *kinetic* energy. There is also *potential* energy, which is the power a thing may have to acquire or produce kinetic energy, in other words the power to do. There is potential energy in the muscles of our arms, but immediately we use those muscles to strike out at something they are producing kinetic energy.

WHY IS THE WATER AT THE BOTTOM OF NIAGARA FALLS WARMER THAN THAT AT THE TOP?

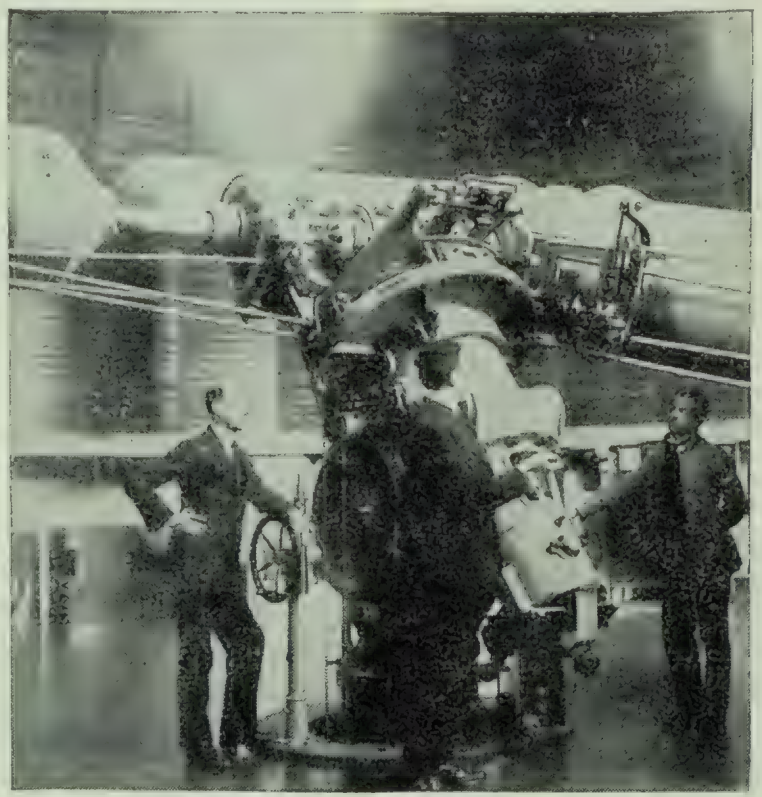
Now the curious thing about all energy is that it tends to produce heat. The impact of a boxer's fist against a punch-ball produces heat. If you could measure the temperature of the Niagara Falls, you would find that the water is hotter at the bottom than at the top, because the water, striking the rocks at the bottom of the falls, generates heat. There is potential energy in a lump of coal, but immediately it is put on the fire the energy is released, and we get heat.

Energy produces heat, heat is life, without heat life on the earth would become impossible, and the great source of energy is our sun. It is the sun which raises the water from the sea, and, turning it into rain, deposits it upon the mountains, down the sides of which it flows in rivers and waterfalls. Green plants draw power from the sunlight, and turn this power into substances upon which certain microbes in the soil feed, and these microbes in turn make the nitrates upon which the plants flourish. Coal is really the remains of vast forests which were formed ages ago by the power of the sun's rays and sank into the damp earth as they died. Now, when we burn a piece of coal, we release this power which for millions of years has slumbered in the coal as the potential energy which now produces heat.

What a wonderful thing it is to think that the sun is the source in some way or another of all power. The express engine, rushing along at seventy miles an hour, is driven by the steam which is raised by the heat from the coal she burns, which heat is the energy of the sun's rays stored up in the coal millions of years ago. Sheep and oxen live on clover and green grass, which in turn flourish on nitrates supplied by microbes which live on food derived from the sun, and did the sun cease to supply this food we, who live on flesh, and vegetables, and other growing things, would die of starvation. When we play a game of hockey or tennis, we are using energy supplied by the sun. The clouds which give us rain, the beautiful colours in flowers, the clothes we wear, all owe their existence in some way or other to that great and wonderful star 93,000,000 miles away.

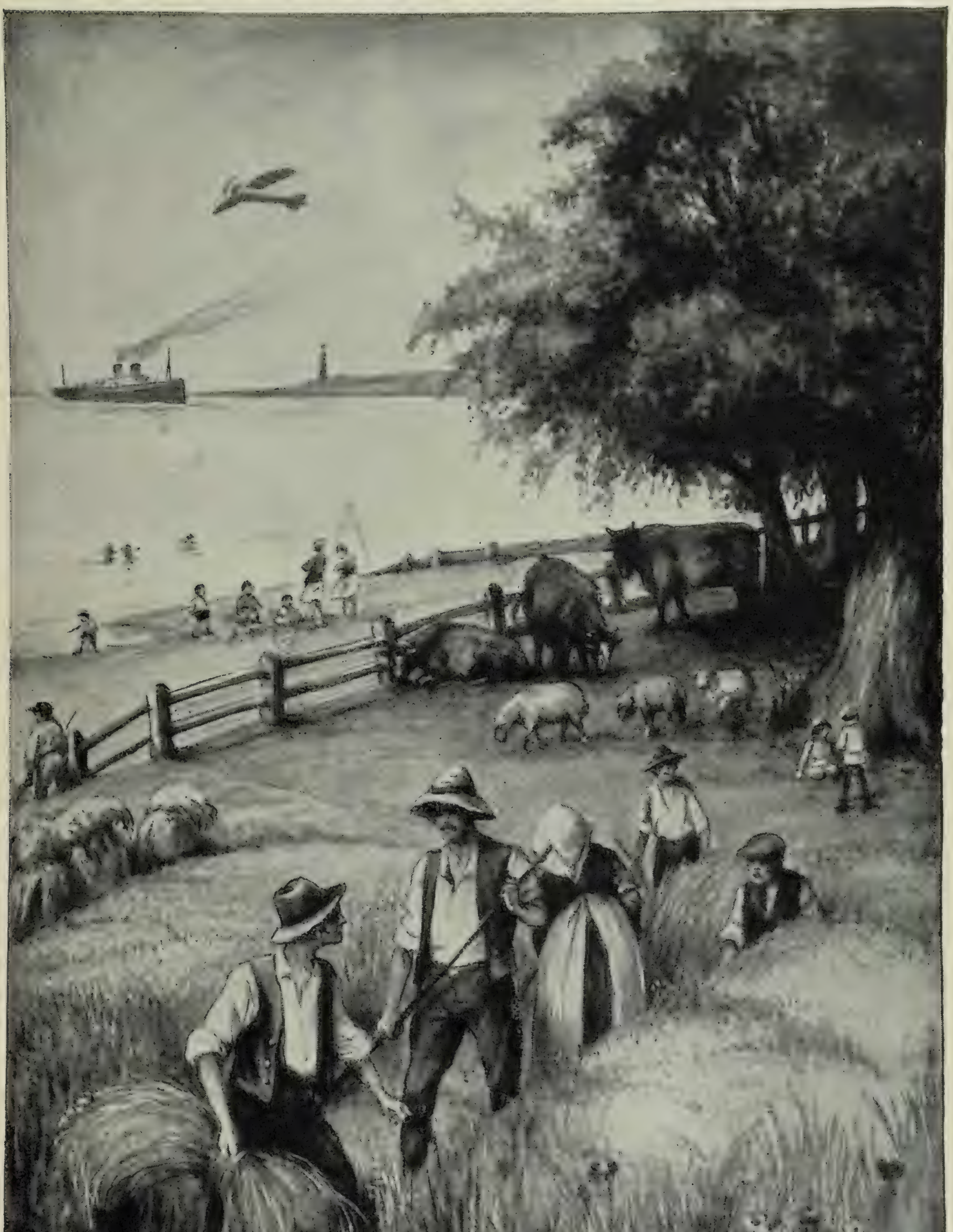
EVERYONE has heard of the law of gravitation. This law is the power all created things have to attract each other. The earth attracts us, and the air we breathe, and the water we drink, and because of this attraction the air and water remain for our use, and when we jump into the air we return to the ground instead of flying on forever. Were the earth's power of attraction suddenly to cease, we, and the air, and the water, and everything else upon the surface of the earth would fly off into space, indeed, the earth would probably break up, for it is the power of one particle of matter to attract another particle which helps to hold our world together.

THIS law of attraction is general throughout space. The earth attracts the moon, and the moon attracts the earth, and the same with the sun. Now the attraction which the moon and the sun exert upon the earth has a very wonderful result. The moon attracts all parts of the earth, but because the water which forms our oceans is less rigid than the land it answers to the moon's attraction more than the land does, and the water *on that part of the earth opposite the moon* is pulled towards the moon into a great watery heap. Were the same part of the earth always turned towards the moon, this heap of water would be stationary. But this is not the case. The earth is forever spinning round on its axis, presenting a new part of its surface to the moon's pull, so that in effect the earth leaves the moon and the pile of water opposite it behind, and there is always travelling round the world a mighty wave of heaped up water which we call a *high tide.*


Here in a famous German observatory we see part of a huge refractor telescope. These instruments are very complicated and their lenses are of the finest quality.

If this were the only heap of water, there would be but one high tide in every twenty-four hours, which is the time the earth takes to make one revolution on its axis. But we know that there are two high tides in every twenty-four hours. How is this? Well, so great is the moon's attraction, that just as it pulls the water into a heap, so also does it pull the earth towards it very, very slightly. But now we discover a curious thing. When the moon pulls the earth towards it, the water on the opposite side of the world is not pulled to the same extent, because, being farther from the moon than the solid earth, the water feels the pull less. The result is that the earth is dragged away from the water on the side farthest from the moon. Then this water, being to some extent left behind, also piles itself into a heap, and we have two waves forever travelling round the world, and forming our two high tides in every twenty-four hours.

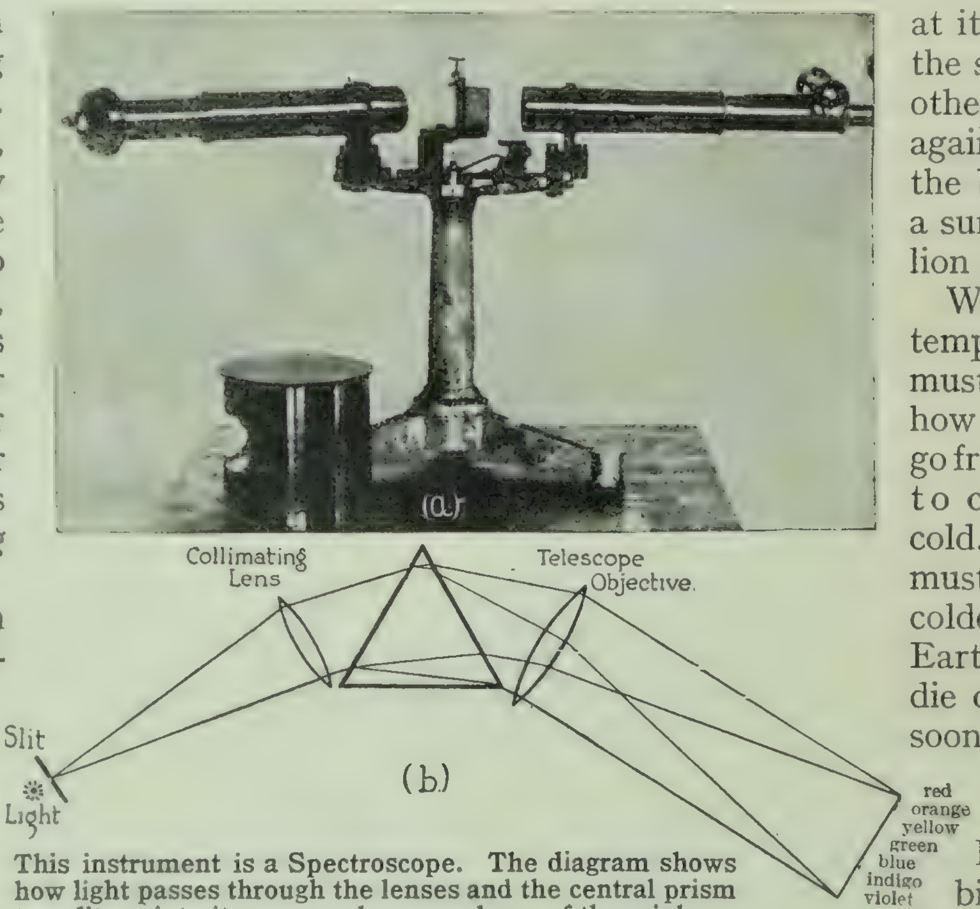
ALL NATURE LOOKS UP TO THE SUN FOR LIFE



The flowers, the harvest, the trees and the meadows all owe their existence to the sun. The children play near the sea, where the sun, through a clearer atmosphere, may bring them health. The cows and sheep eat the sun-filled grass, and in their turn give us food, drink and clothing. Coal, with its stored-up energy, drives the engine of the steamer.

And in between the high tides are shallow places which correspond with the low tides.

So far we have only considered the moon, but the sun also attracts the earth, only, being so much farther from the earth, its power of attraction is less than the moon's. Now, in the course of the moon's monthly journey round the earth, there come times when the sun and moon are both pulling against the same side of the earth, and other times when they are pulling on opposite sides. When this happens, at the times of new and full moon, the water is heaped up higher than usual, and for a few days the sea rises higher and goes out farther than at any other times. These tides are known as *spring tides*.



This instrument is a Spectroscope. The diagram shows how light passes through the lenses and the central prism to split up into its seven colours—colours of the rainbow.

But when the sun and moon are pulling against each other at right angles, during the moon's first and third quarters, they have the opposite effect. Owing to the counter attraction of the sun, the moon's heap of water is less than usual, and the sea rises to the lowest possible height and goes out the shortest possible distance. These tides are called *neap tides.* In between the spring tides and neap tides we get medium tides.

The tides have a very important effect upon our daily lives. They wash our shores and keep them clean. They flow up and down our rivers, helping ships into port, or starting them on their voyages to distant lands. One day we shall harness the tides. Then our homes may be lighted and warmed, our food cooked, and many other useful things done by electricity produced by machinery which derives its power from the rising and falling of the sea.

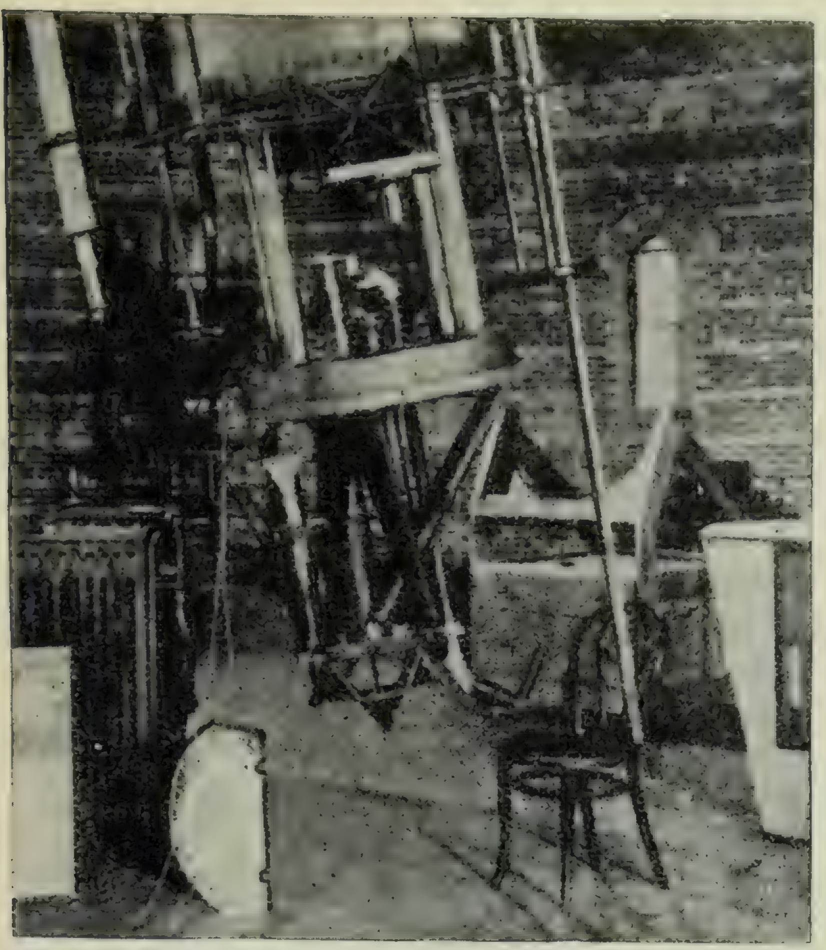
The Earth is not the only child of the sun. There are seven other planets all derived from the same source, and it will be interesting to see in what ways they resemble or differ from our own planet, Earth.

Mercury is the planet nearest to the sun, and it is also the baby of the sun's family of worlds. Mercury must be a curious world to live on, if life exists. It revolves round the sun in 88 of our earthly days, so that a year on Mercury is less than three of our months. At its nearest it is only 28,570,000 miles from the sun ; yet 44 days later, so elliptical is its path through space, that distance has increased to 43,347,000 miles. But now it is at its farthest from the sun, and in another 44 days it will again be basking in the blazing rays of a sun only 28½ million miles away.

What changes of temperature there must be on Mercury, how quickly it must go from blazing heat to comparative cold. Yet so hot must be Mercury's coldest day that an Earth-man would die of sunstroke as soon as he set foot on the tiny world.

In all probability, however, Mercury, like our moon, is a dead world, a world which has passed through its span of life, and now rolls through space, an airless, dried-up skeleton of its former self. Some astronomers think that it resembles the moon in another way. Owing to the earth's attraction, the revolution of the moon upon its axis has so slowed down that now it takes the same time to turn round once as it does to revolve once round the earth. The result of this slowing down is that the moon always turns the same face to the earth. Owing to variations in the moon's turnings a little more than half the planet has at various times been seen, but human eyes have never seen its other side. As the earth has acted as a brake upon the moon, the sun may have acted as a brake upon Mercury, so that now it only makes one revolution on its axis in 88 days.

If such is the case, Mercury always presents the same face to the sun's rays, and the chances of there being life upon the planet are enormously decreased. For, under the blazing



This is where the astronomer sits to read the secrets of the heavens. The telescope has a spectograph attached.

rays of the sun, one half of Mercury would be a parched desert of intolerable heat, whilst the other half would be a frozen waste wrapped in everlasting night.

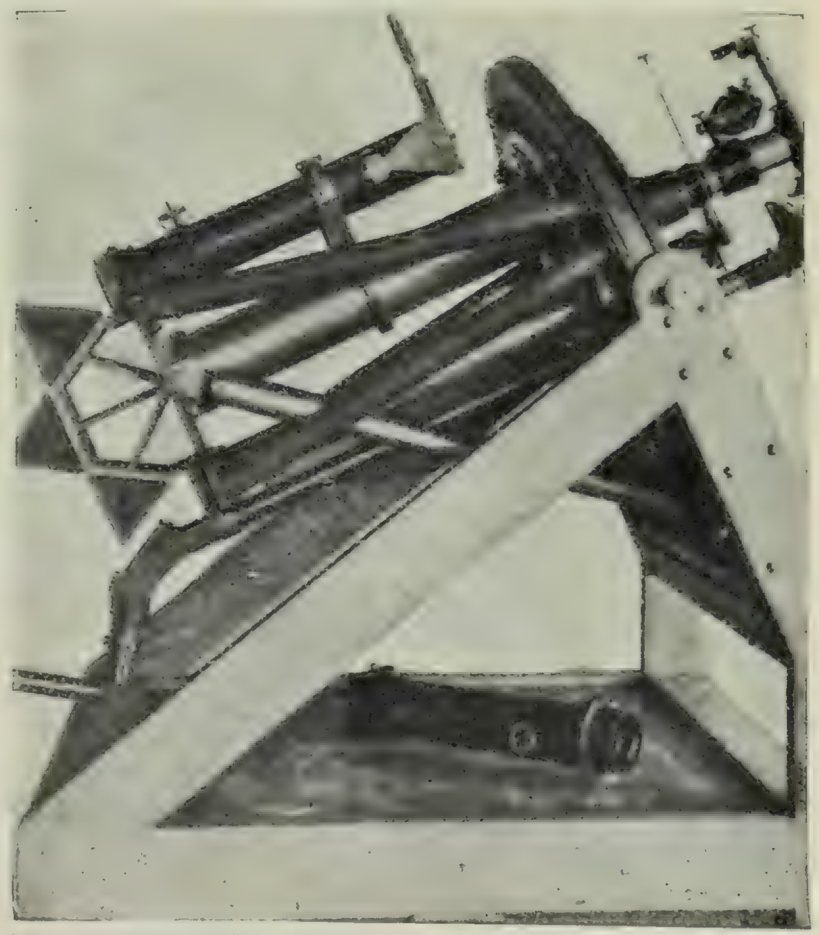
Travelling outward from the sun we next come to Venus, the planet where the conditions are probably most similar to those we know upon earth. Venus is almost the same size as the earth, she has a day of almost equal length, and revolves round the sun at a distance of 67,000,000 miles in 224 days. Observations show that Venus possesses a very thick, cloudy atmosphere. Such an atmosphere would temper the sun's heat, and the days on Venus may not be very much hotter than our own tropic summers. The presence of clouds betokens the existence of water, so that we may assume Venus has seas and oceans as the earth has. Indeed, of all the planets, Venus is the one we should choose if, through some unknown cause, we were compelled to leave the earth, and could find means of transporting ourselves to another world.

NEXT to Venus comes our own planet Earth, and then, at 140,000,000 miles from the sun, we reach Mars, the red planet, and the ancient God of War. Mars is about half the size of the earth, and consequently its force of attraction is much less. Were an earth-man to land on Mars his muscles, accustomed to the greater pull of the earth, would be able to do about three times the amount of work which they do in this world.

Being smaller, Mars is also an older planet than the earth, for the smaller a planet the quicker does it pass through the various phases of its existence. Mercury is probably a dead world, Mars a dying world. The Martian atmosphere is very thin, no clouds hide the surface of the planet, so we may assume that Mars is a very dry world. Countless centuries ago, Mars most probably had plenty of air and water, as we have on earth, but owing to the smaller bulk of Mars and its lower power of attraction, the tendency of such air and water would be to escape from the planet into space, until Mars is as we see it to-day, a world slowly dying of suffocation and thirst.

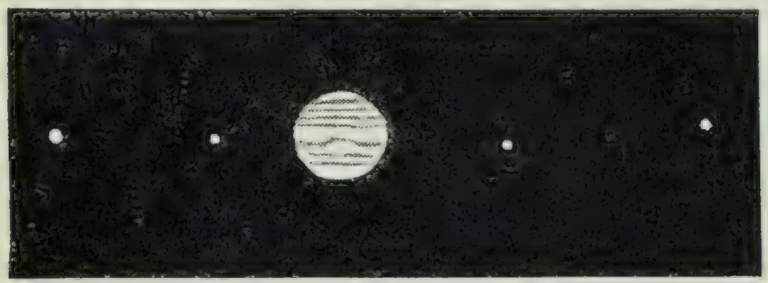
IS there life on Mars ? If so it must be life greatly in advance of our life on earth. Thousands of years ago, the Martians would have perfected wireless and aeroplanes, and our wisest men would be ignorant compared to their philosophers, presuming life on Mars developed along similar lines to life on earth. There have been many theories regarding life on Mars and the *canals* have puzzled astronomers.

Every one who has heard of Mars has heard of the Martian canals. Whether there are such canals or not is a point upon which astronomers disagree. Those who favour the canals say that they can see through their telescopes a vast number of straight lines starting at the poles, and crossing the planet in all directions. These lines they contend are canals dug by the



The spectrograph is here seen taken away from the telescope in the picture in the previous column. *See p.* 19.

Martian engineers to carry the ever-diminishing supply of water to various parts of the planet. On the other hand, many astronomers say that most of these lines are non-existent, or are due to optical illusions. Whoever are right, one thing is certain. As the Martian winter advances, white caps appear round the poles. These white caps have all the appearance of snowfields such as exist on a much vaster scale round the earth's poles, and that they are frozen water is further borne out by the fact that they melt and almost disappear with the Martian summer. We may conclude, therefore, that Mars has both air and water, but so very little of either that it must be a very dry and airless planet, the greater part of which consists of huge sandy deserts like the Sahara.


The immense new world known to us as Jupiter looks like this through an astronomical telescope. The four nearest of its eight moons are seen here.

Neither Mercury nor Venus has moons, but Mars has two moons, one of which revolves round the planet three times in the Martian day of 24½ hours.

WHY WOULD A MAN ON JUPITER LIVE TO BE A 1000 YEARS OLD?

Next in space we come to Jupiter, a giant in our family of worlds. Jupiter is 88,000 miles in diameter, eleven times larger than the earth, and it revolves round the sun at a distance of 483,000,000 miles.

Jupiter is a young world, for just as tiny Mercury is probably a dead world, so Jupiter, because of its immense size, has lost heat less quickly than the smaller planet, and is a world in the making. As the earth was ages ago, so Jupiter is now—a great red-hot globe of seething vapour, a small, dying sun which millions of years hence, when it becomes cool enough and solid enough, may become a living world. Jupiter has no less than eight moons, and it requires nearly twelve earth years for this great planet to make one revolution round the sun. What calendars the future people of Jupiter will need! A man on Jupiter who lives to a hundred will be well over a thousand earth years in age.

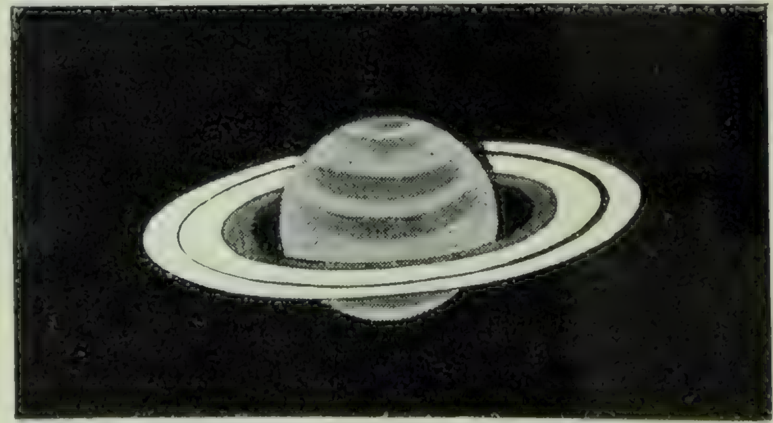
Eight hundred and eighty-six million miles from the sun is another world in the making. This is Saturn, a huge mass of seething gases and metallic vapours, 719 times larger than the earth. So far away from the sun is Saturn that it only receives a ninetieth part of the heat and light the earth receives, so that it revolves through space in perpetual twilight. When millions of years hence Saturn solidifies it will be a gloomy world to live in, and its forms of life will probably be very different from ours.

A BEAUTIFUL SIGHT IS SATURN, WITH THE WHIRLING METEORITES THAT MAKE ITS RINGS.

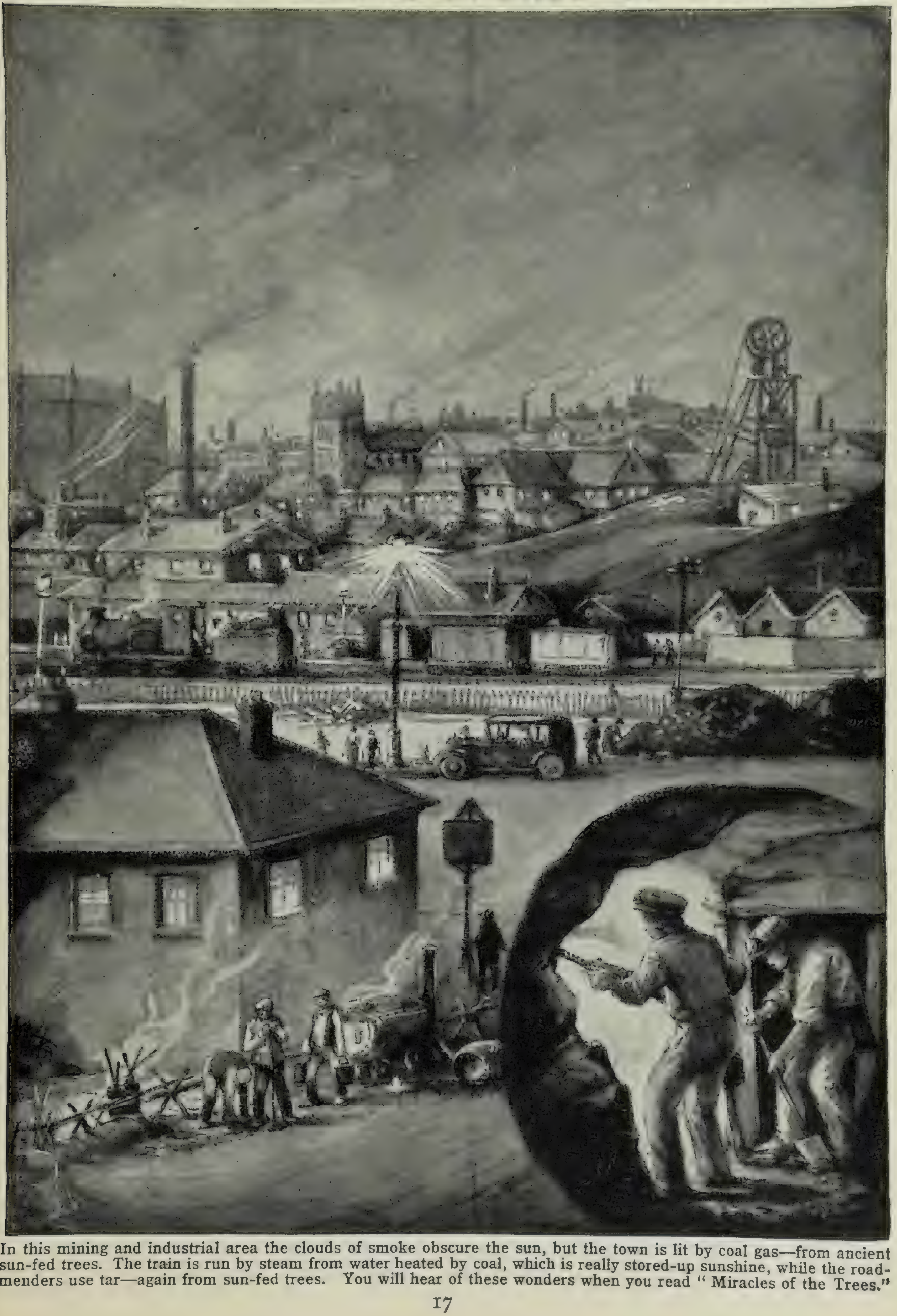
Saturn's chief attractions are its rings. These rings are bright belts surrounding the planet at a height of about 12,000 miles above its equator. They are probably composed of countless meteorites which are forever whirling round the planet, and catch and reflect the sunlight so that we see them suspended in space like a golden halo round the globe of Saturn. Saturn has ten moons, and with these and its rings forms one of the most beautiful sights in the sky.

On, on into space, 895,000,000 miles we must now go before we come to the next member of our solar system, Uranus. Uranus is invisible, except through a telescope, to any but the keenest vision. It is a gloomy planet, and takes 84 earth years to make one revolution round the sun. Like Jupiter and Saturn, it is still too hot to have hardened sufficiently to support life. Though smaller than its two big brothers, Uranus is yet larger than Earth, Mars, Venus and Mercury put together.

Far out in space, 2,791,000,000 miles from the common centre of life, Neptune, the most distant of our sun's family, travels its dark and lonely road. Neptune is quite invisible to the naked eye, indeed, no one suspected the presence of a world beyond Uranus until the beginning of the nineteenth century, when astronomers discovered that there was some unknown body influencing Uranus, and retarding its course through space. Thereupon, they set out to discover this unknown body,


What would it seem like were it possible to stand on Saturn, and be encircled with belts of ever-moving light? Saturn boasts of ten moons—two more than has Jupiter.

SUNLESS, YET USING STORED-UP SUNSHINE



In this mining and industrial area the clouds of smoke obscure the sun, but the town is lit by coal gas—from ancient sun-fed trees. The train is run by steam from water heated by coal, which is really stored-up sunshine, while the road-menders use tar—again from sun-fed trees. You will hear of these wonders when you read " Miracles of the Trees."

and, without looking through a telescope, two young mathematicians worked out the position and bulk of the unknown, and fixed the point where it would be in the sky about a certain date. When the astronomers came to search that part of the sky there, sure enough, they discovered a new planet which they christened Neptune.

NOT much is known about Neptune. It is so far away that the most powerful telescopes tell us little of its physical conditions. It is slightly bigger than Uranus, and probably is still in a liquid state, and too hot to support life. If life ever comes to this distant planet, it will be life able to stand intense cold. At the immense distance from the sun at which Neptune travels through space, it receives nine hundred times less heat and light than the earth does, and our polar regions would be warm compared with the temperature of a Neptune solid enough to support life.

The earth spins round the sun in 365 days, and in that time we have the cold of winter, the joy of spring, the warmth of summer, and the golden splendour of autumn. Neptune takes 164 earth years to make one similar revolution round the orb of day. What a dreary, changeless, cold existence life on Neptune would be.

In this view of Mars you will notice certain lines. Some astronomers think that Mars has inhabitants and that the straight lines are canals made for watering the fields.

The earth was once a tiny sun, but because it was so small it lost its heat comparatively quickly and became solid, and, receiving light and energy from the greater sun round which it revolved, it became the home of abundant life.

We have already read how stars are born from clouds of gas called nebulæ. Once a small, spiral nebula, small in comparison with the giant nebulæ of space, was rushing along its destined path through the heavens, and as it rushed along it revolved. The point round which it revolved we call the nucleus, and in the course of untold ages the more solid particles of the nebula gravitated, that is, were drawn, towards this nucleus, until gradually, in the centre of the nebula, there was built up a huge and brilliant sun.

But this sun was not the only star built up in the nebula. From the parent nebula, great knots were thrown off, which in their turn became centres of attraction, and as they grew bigger so they drew more and more of the particles of the nebula to themselves. Meteorites from space, coming within the spell of their attraction, fell upon them in swarms, until gradually other and tinier suns were formed—suns which went on revolving round the central star just as the nebula had revolved round the nucleus when it was nothing more than a cloud of gas. In some such way our solar system was probably born. The central star was the beginning of our sun, and the smaller suns were the planets in the making, and one of them was the earth.

All this happened unknown millions of years ago, and the tiny sun had to go through many changes before it became the beautiful world we know. What these changes were you will read in another part of our story.

A few hundred years ago people thought that the earth was stationary, and that day and night were caused by the sun and all the stars revolving round the earth. Now we know that such a movement is impossible. For the sun, 93,000,000 miles away, to revolve round the earth once in twenty-four hours it would have to travel at a colossal speed, whilst the more distant stars would be rushing round our world at an impossible speed.

WHAT CAUSES DAY AND NIGHT, AND WHAT REGULATES THEIR LENGTH?

It is the earth's revolution on its axis which causes day and night, just as it is the earth's revolution round the sun which gives us spring, summer, autumn and winter. These movements are very important. If the earth did not revolve, our days and nights would each be six months long, whilst it is the speed of over 1000 miles a minute, at which the earth travels round the sun, which keeps it from falling into the sun and being destroyed. The sun and earth, indeed, are always carrying on a tug-of-war, the sun by its attraction endeavouring to drag the earth towards it, whilst the earth is forever trying to escape from the sun and fly off into space. Fortunately, these two opposing forces balance each other, or life on the earth would come to an end.

BESIDES these two movements there is another movement more stupendous still, but of which we are entirely unconscious. You have read that there is nothing still in space, that all the stars are rushing along their destined paths at headlong speed. Our sun is a star, and like all other stars it is hurtling through space, drawing the earth and the other planets after it. To-day we, and the sun, and all the other worlds are a million miles away from the point in space where we were yesterday, and this time to-morrow we shall be a million miles away from where we are to-day, and, as far as we know, never in all eternity will the sun and its planets traverse again that part of space through which they are now rushing at such tremendous speed.

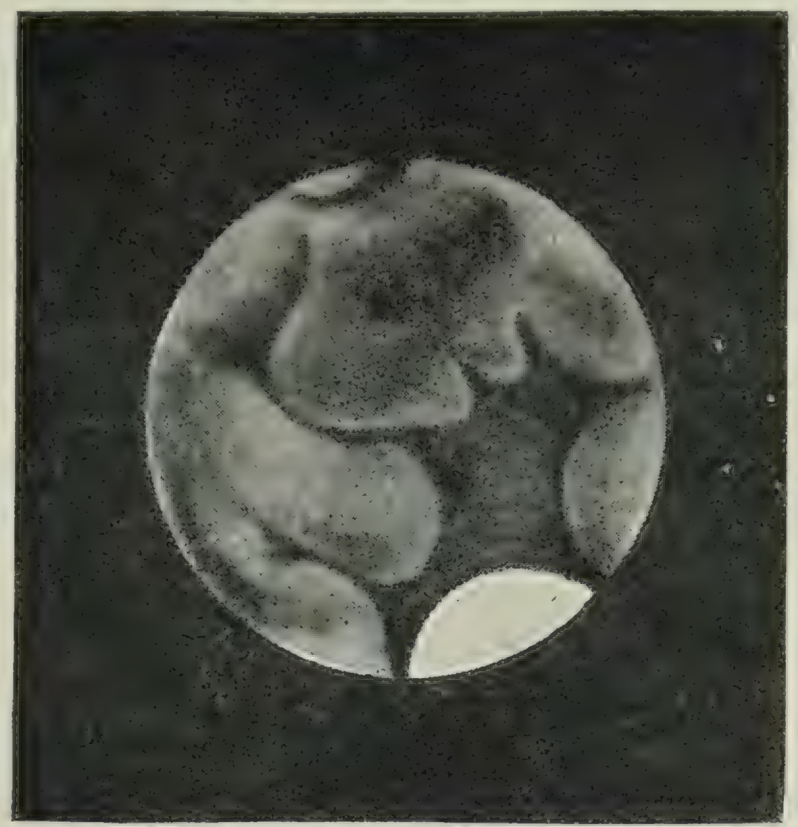
There are two instruments used in astronomy without which our knowledge of the stars would be very small indeed. These are the telescope and the spectroscope.

Modern telescopes are of two kinds, known as *reflector* and *refractor* telescopes. A *reflector* telescope is a telescope in which the light from whatever celestial bodies are being examined is gathered on to a mirror at the bottom of the tube, and from this mirror the light is focused to an image which is viewed through the eyepiece of the telescope.

A *refractor*, on the other hand, is the sort of telescope we all know. In it there is a large lens at the top of the tube, and a small eyepiece at the bottom. The lens at the top gathers the light from the star or planet which is being examined, focuses it to a small image which, in turn, is magnified by the eye-piece at which the observer is watching.

Reflector telescopes are more widely used than *refractors*. It is easier and less expensive to make a huge mirror than a huge lens. The largest *refractor* has a 40-inch lens at the top of the tube, whilst the *reflector* in the Mount Wilson Observatory, California, has a mirror measuring 100 inches in diameter, and brings the moon so near the earth that a building like the Houses of Parliament would be visible on its surface.

You must not think that astronomers sit for hours looking through their telescopes. Nowadays the camera largely takes the place of the human eye, for it will often show things which are quite beyond the observer's vision. The reason for this is that the camera has the power of storing up light. A distant star may be so faint as to be invisible to the observer, however long he looks, but with the camera the light from the star is focused upon the sensitive plate, and during the long hours of exposure an image is gradually built up which, when developed and printed, appears as a tiny spot of brightness. Astronomers are in this way able to observe many inhabitants of space otherwise beyond their reach.

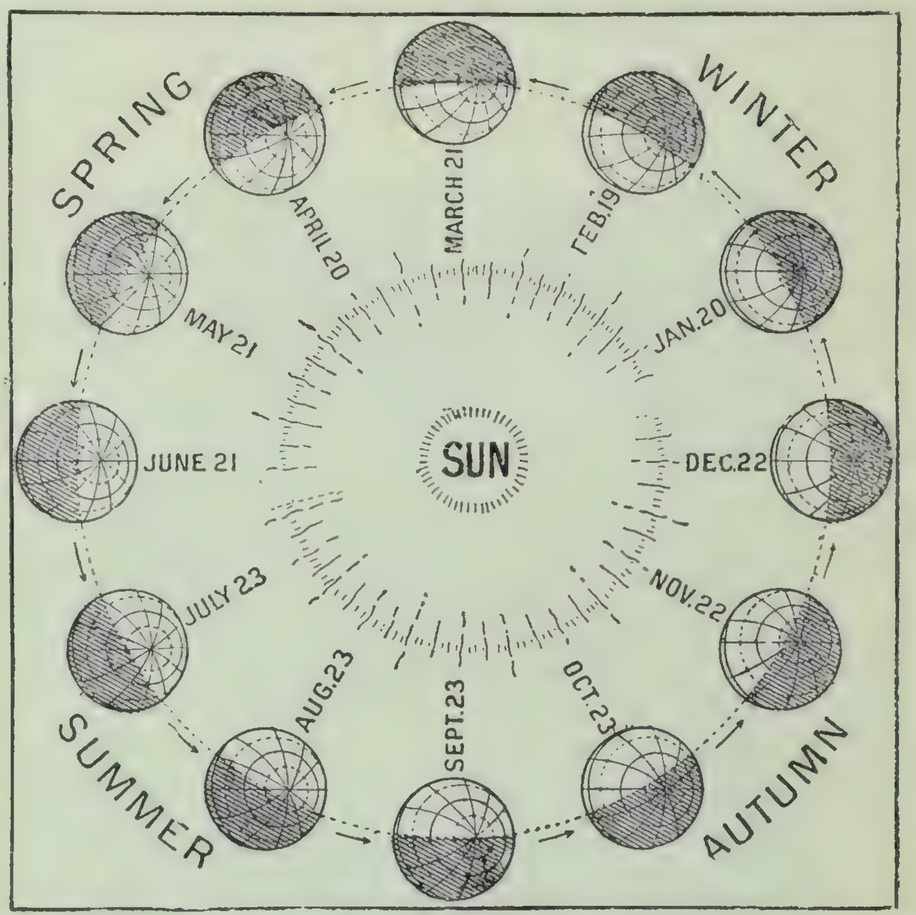


Here is another view of the planet Mars. The "canals" are not visible and the white portion is one of the polar ice caps. This is therefore a winter picture of the planet.

AS important as the telescope is the spectroscope, for it is the spectroscope which tells us what our sun and the stars are made of. This wonderful instrument has the power of analysing light by breaking it up into its rainbow colours. Sunlight, or white light, passing through a spectroscope, gets broken up into seven different colours ranging from red at one end of the scale through orange, yellow, green, blue and indigo to violet at the opposite end. Combined, these coloured rays make *white* light, and this special arrangement of colours is called the *solar spectrum*, because it is the analysis of a ray of light received from the sun. It has been discovered that different substances have their own distinctive lights, and these lights can be analysed by the spectroscope in the same way as it analyses sunlight.

Every substance, in fact, has a spectrum of its own, and when light, passing through the spectroscope, shows us this distinctive spectrum, then we know that the substance is present in the body from which that light comes.

Thus we know that the sun contains iron and copper, and several other minerals and gases known on earth, though not of course in solid form. By analysing the light of stars, scores of light-years away, we are able to say that such a star contains hydrogen, and another magnesium, we are able to prove the presence of substances known on earth, and others which are strange to us. Once, indeed, a gas was discovered in the sun before we knew of its existence on the earth. This is the gas *helium* which was discovered in the sun in 1868, but the presence of which on earth was unsuspected until almost thirty years later, when it was found in certain minerals present in our globe.



The earth's position throughout the changing seasons of the year is here shown. Our globe spins on its axis and at the same time rolls through space to complete the round of the sun in a year's journey.

One feels inclined to call the spectroscope more wonderful than the telescope. The telescope shows us what is visible, but the spectroscope tell us the hidden secrets of the distant suns of space.

THE actual changes in a star are so slow that even in the period from the dawn of history to the present day we should hardly discern the slightest alteration. But a botanist in a forest does not need to wait to see a tree going through all the stages of its career from an acorn to an old gnarled oak. He has only to compare the specimens that he sees before him, at all stages of their career, in order to reconstruct the cycle of change for himself.

We do the same for the stars. If we were able to use such a compressed time-scale that a million years was compressed into a second, we should probably see under our eyes nebulous matter condensing and growing hotter till it formed a nebulous star; the process would continue till the maximum temperature was reached, when the object would look like a Sirian star. Presently this would pass into the "Solar" stage, when the light would have become yellowish, owing to atmospheric absorption. The colour would eventually deepen through orange into red.

THEN a crust would begin to form, and the light would begin to flicker; the process would continue, with perhaps a few spasmodic outbursts, till the star ceased to radiate light, and reached the stage through which Jupiter and Saturn are now passing. It would have become a "Dark Star," of which multitudes doubtless exist in space; they may once more be quickened to activity by the near approach of or collision with another great orb.

Many suppose that our Sun in long past ages had reached such a dark stage, and regained youth and vigour by an encounter with another star. On this view the planets, meteors, and comets are the remains of the matter torn from him by the graze. Meteors on this view formed a part of the ancient crust of the Sun; their highly complex structure, and the large amount of hydrogen and other gases that they contain, would thus receive an explanation.

Thus worlds come into being and worlds die out. We only know a very small part of the universe, and it may well be that away in space far beyond our reckoning or imagining there are other greater worlds than ours. Astronomers scan the deep blue of space continually. Who knows what next they will find?

A man would only reach half-way up the leg of this Brontosaurus, a huge creature with small head and tiny brain.

OUR OLD, OLD WORLD

After a swift journeying among the distant stars, we return to our earth, to watch its young life. We shall see its gradual cooling and solidifying, its wrinkling into mountains and valleys, and finally its becoming the home of living things. The amazing story of life, from tiny water creatures to the mountain-like dinosaurs of sixty feet in length, will be told. Finally we shall notice that from the world of animals, birds, reptiles, fishes and insects, there arises an animal that walks upright. It develops a cunning unknown to other animals. It learns to speak, to write, and what is most wonderful of all—to think. This animal, whose power of mind and mastery over Nature's forces make it King of all living creatures, is Man.

WE have read how our earth was built up from the parent nebula. This process of birth must have occupied millions of years. At first the earth was not very hot, but in the course of ages the particles of matter of which it was composed would tend to draw closer together, with the result that the earth grew smaller and hotter, until perhaps it was white-hot. But now, having reached its greatest heat, the earth began to cool. It was still slowly growing smaller, but the process no longer generated heat. From a seething globe of gas, the earth became liquid, and we can picture our world in those far off days as a spouting, red-hot globe of molten rock and metals surrounded by a vast pall of clouds. About this time, too, a wonderful thing happened. The sun's attraction, acting on the soft earth, broke off a large piece of its mass which in course of time became the moon.

Countless ages passed, and upon the surface of the molten globe a solid crust had formed. It was a very thin crust, and it was constantly being broken by appalling volcanic eruptions, as the heat from the boiling interior burst its way forth. Moreover, this crust was very hot, so hot that it could not hold water; indeed, water had not yet formed, for though there were hydrogen and oxygen in the thick clouds surrounding the earth, the heat from the young world was still too intense to allow these gases to unite and form water. Also, it was a dark world, save for the lurid light given out by its volcanic fires. At this stage of the earth's history, and for many thousands of years to come, no sunlight penetrated the pall of clouds which surrounded it on all sides.

More ages passed. The earth was cooler, and at last there came a time when the hydrogen and oxygen in the cloudy envelope united and formed steam. Presently the steam condensed, and the first rain fell. This first rain was scalding hot, and it was turned back into steam before it reached the still hotter earth, but gradually, as more and more rain fell, and the earth went on growing cooler, water began to collect in the hollow places in the earth's crust. The pools thus formed were the beginnings of the first seas, which, fed by the ceaseless torrents of rain, slowly spread over the whole world, until there came a time when the entire earth was probably covered with water. But, meanwhile, the earth's crust was steadily cooling, and as it cooled it crinkled into highlands and lowlands, and the highlands, rising above the steaming seas, became the first continents.

HUNDREDS OF YEARS OF CONTINUAL RAIN IN A TWILIGHT WORLD.

At this time the earth was still a dark world, for the cloudy envelope remained unbroken, and no sunlight could come through. It was a world without day or night, a world without seasons, also it was a dead world without so much as a single weed or a tiny insect to break the loneliness of its steaming oceans and its barren lands.

The earth at this stage was still very hot. The seas gave off vast clouds of steam which condensed in the clouds above, and descended in torrents of rain. There may have been a period in the earth's history when it rained for hundreds of years without stopping. Centuries passed, and the earth had become considerably cooler. The cloudy envelope was thinner, but it still cut off all direct sunlight, and the earth existed in a sort of perpetual twilight. It was somewhere about this time that the first life appeared on earth. It was what we might call the self-sustained age of the earth. These very simple forms of life which then existed owed their very lives to the earth's heat, and not to the sun which so far had done little for the earth.

THE SUN BREAKS THROUGH, AND THE WORLD SPRINGS INTO LIFE.

But now, at last, the clouds, which had surrounded the young world for such countless centuries, began to break, and sunlight fell upon the globe. At once the old order of things began to pass, and a new order to take its place. For the first time in the earth's history there was day and night, for you must remember that ever since its creation the earth had been revolving on its axis, probably at a much greater rate than the speed at which it is revolving to-day. Seasons began. Colour appeared. The heat of the earth, which for millions of years had been bottled up by the cloudy envelope, escaped more rapidly, so that the earth cooled more quickly, and the low forms of life already in existence changed into something greater under the genial influence of the sun's rays. The earth had, indeed, ceased to be entirely self-supporting, and was entering upon the sun-sustained age of its existence. We are still existing in the sun-sustained age ; without the sun we could not live.

All this happened very long ago. Some scientists think that as many as 150,000,000 years may have elapsed since the earth first formed a solid crust. Since that time earthquakes have crinkled and distorted that crust. Mountain chains have been thrown up, and levelled by the action of wind and rain. Ice-ages, in which much of the world we live in to-day was covered with snow and ice, have come and gone, leaving the marks of their passage behind them upon valley and mountain side. Continents have risen, and disappeared under the sea, until, in the course of millions of years, there has been formed the world we live in, the different lands and wide seas we know to-day.

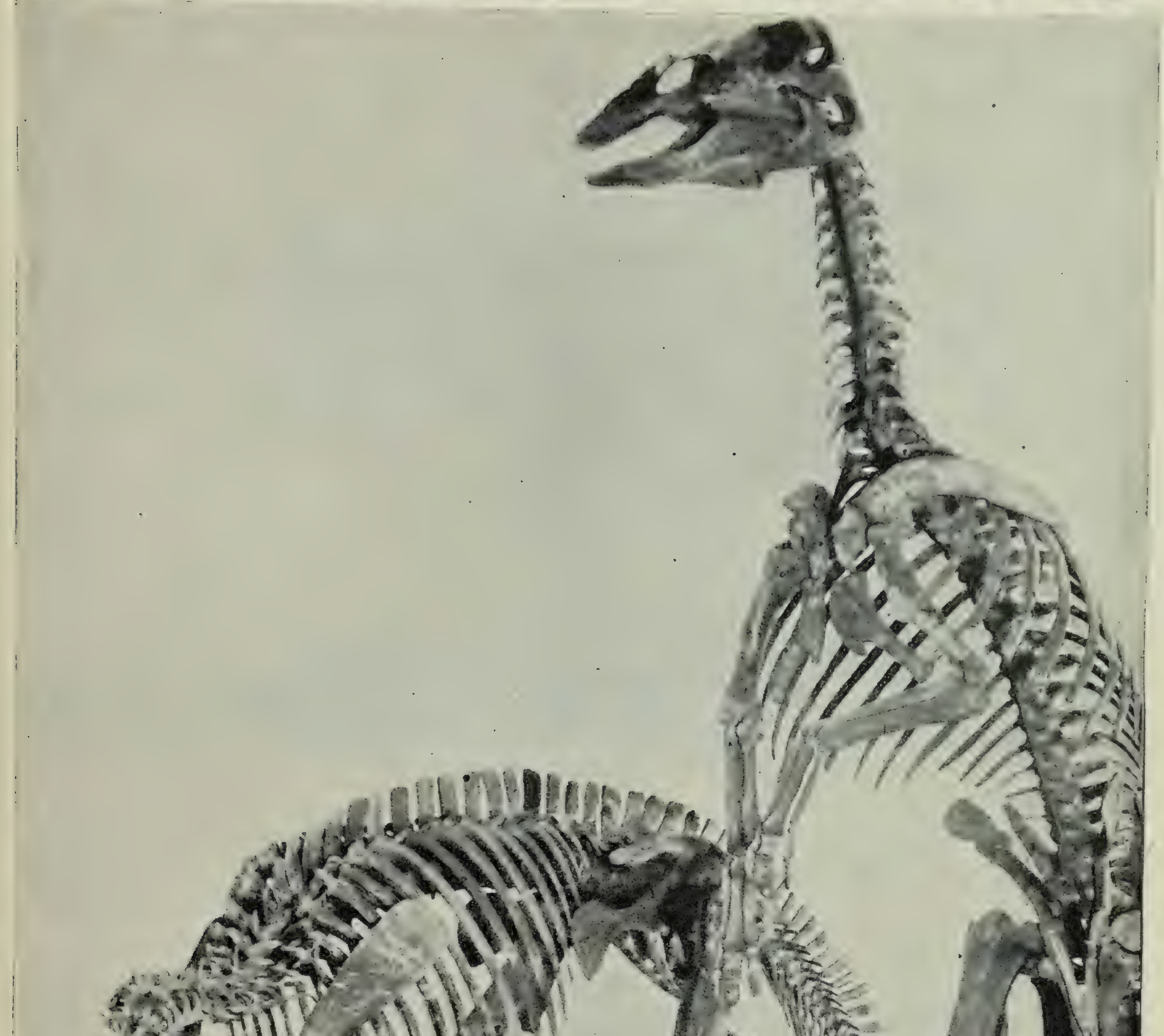
THE COMING OF LIFE TO THE WORLD IS STILL ONE OF ITS UNSOLVED MYSTERIES.

The earth's first thin crust has now thickened to a solid shell of rock fifty miles in depth, but of what exists below this little is known. That the interior of the earth must be very hot is proved by the existence of volcanoes and hot springs. Probably we shall never know for certain what the inside of our world is like, for the deepest coal mine does not penetrate much farther than a mile into the earth's crust, whilst the centre of the globe is 4000 miles beneath our feet.

When we compare the teeming world of to-day with what the world must have been millions of years ago, a lifeless, barren waste of baking earth and steaming water, we wonder how such a world could ever become the home of reasoning beings, of beautiful flowers, and of all the myriad growing, breathing things which come under the great heading *life*.

How did life begin ? Did chemical compounds in the earth become alive through some process of fermentation ? It seems hardly possible, for all our present knowledge goes to prove that life must come from life. Were tiny living creatures brought to the earth in the cracks of the meteorites which fell upon the earth in swarms during the hot days of its youth ? Perhaps ; yet, if this were so, we still do not know how life began, for there is still to be shown where the creatures in the meteorites came from. The truth is that no one knows how life began in a lifeless world. It is one of the great, unsolved wonders of

GIANT DWELLERS IN THE WORLD OF OLD



These duck-billed dinosaurs once wallowed in the slime of the youthful world. Beside them an elephant would have seemed very small. These skeletons have been reconstructed from fossil bones. [*Courtesy Am. Museum of Nat. History*

These are stone models of the giant reptiles of old. Note the dinosaur, whose massive head rises above the trees.

creation, how a world which was a desert could become a flowering garden. But if we cannot say *how* life began, we know *where* it began. It began in the sea.

BUT, before we begin to trace the growth of life on the earth, we must know where our knowledge comes from. It comes from the earth itself. The rocks, which form the earth's crust, are the earth's history book. The mud and sediment of one age become, in various ways, the rock of the next, and as we turn back the rocky pages, until we come to the earliest formed rocks, we are able to read in the fossilised remains we find buried in these rocks the history of life on earth.

Life began in the sea. Ages before there was so much as a tiny clump of lichen growing on the land, the steaming oceans of the earth were full of living things. This life began in the self-sustained age of the earth, before the sunlight had had any great effect upon our world. These first creatures were probably tiny, soft, boneless things, for they have left no traces of their existence in the rocks as would have happened had they possessed skeletons which could have become fossilised.

So this first life passed away, leaving behind no trace of its existence, but overlying the rocks which in their days were mud, and on which they crawled and lived, there is another layer of very ancient rock in which we do actually find the first signs of life. These signs are very slight. There are the tracks of a tiny creature like a worm, miscroscopic skeletons, and traces of very simple plants. The rocks in which these first traces are found are called the *Protozoic* (or " First Life ") rocks, and they are the first page in the earth's history of life.

The next page is more imposing, but still it holds no promise of what is to come. We will call it the *Palæozoic* page, for the rocks on which it is written are called *Palæozoic* (or " Ancient Life ") rocks.

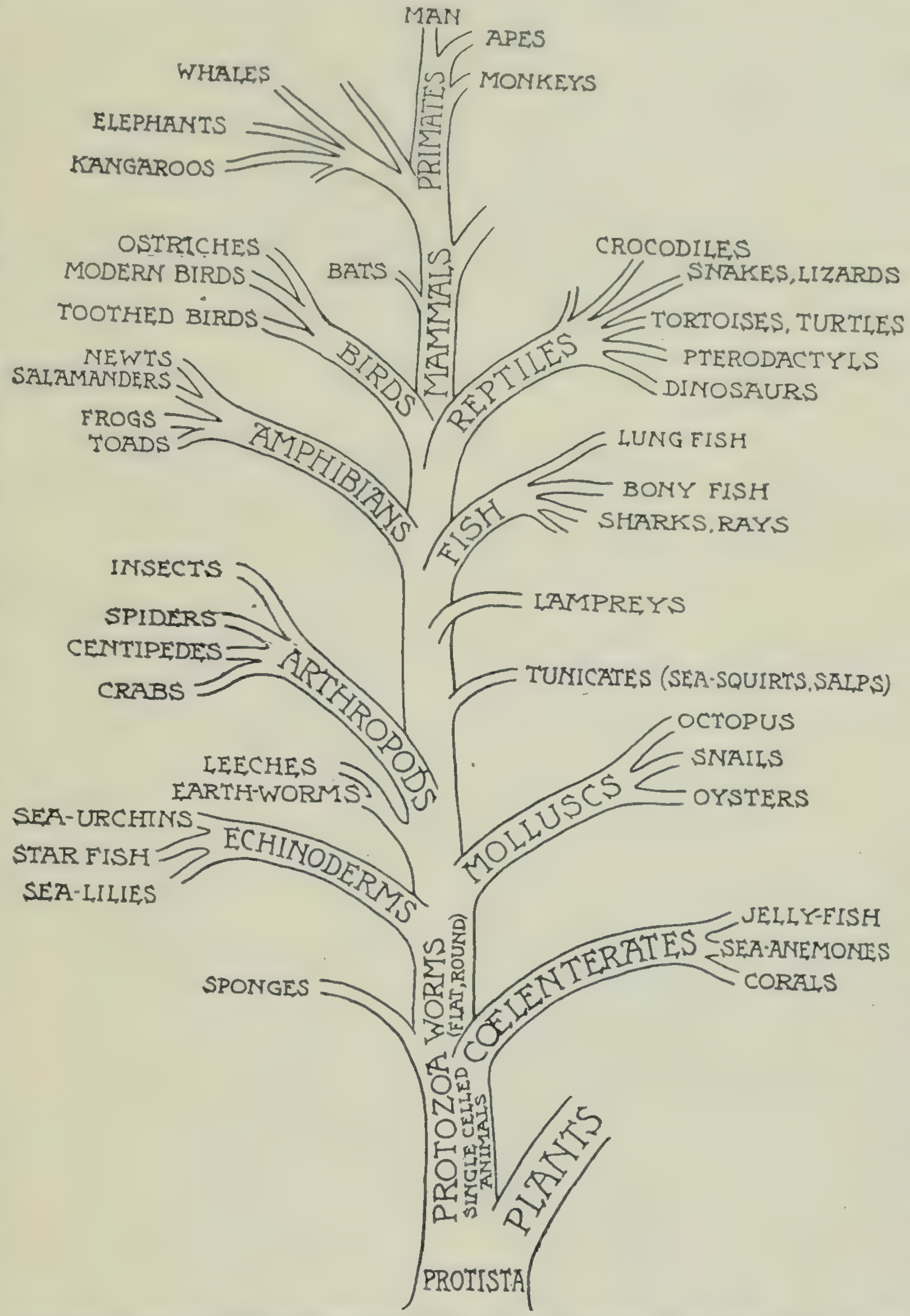
Early Palæozoic life consisted of crabs, shellfish, worms, several kinds of fishes, seaweeds, and sea-scorpions. These sea-scorpions were often eight feet long, and they were the most highly developed form of life which the earth had so far produced, and for millions of years life on earth was limited to creatures of this description. Moreover, life still clung to the sea. The land was still bare and desolate.

IN those far-off days when life clung to the sea, it was fatal for any living creature or plant to get stranded on the seashore, for immediately it did so it dried up and died.

Even to-day, nothing living can exist without water. A man deprived of water dies, so does a tree, but in the course of ages of evolution both man and tree have developed means of retaining moisture, so that they are able to live *away* from water, provided they can get water at fairly regular intervals.

But it was not so with the earliest forms of life. They could not live away from water, for they had no means of retaining moisture, and once out of the sea they died immediately. Water was, in sober fact, their very life-blood, and before any living thing could leave the sea for the dry land it had to develop some means of keeping that precious fluid from draining away immediately it came in contact with the outer air.

Seaweeds and sea plants probably made the first move from sea to land. They often got stranded on the seashore in between the tides, and the need for some means of retaining their moisture during low tide gradually caused them to develop an outer skin thick enough to keep them moist until the tide returned.


MAN
APES
MONKEYS
PRIMATES
WHALES
ELEPHANTS
KANGAROOS
MAMMALS
BATS
OSTRICHES
MODERN BIRDS
TOOTHED BIRDS
BIRDS
CROCODILES
SNAKES, LIZARDS
TORTOISES, TURTLES
PTERODACTYLS
DINOSAURS
REPTILES
NEWTS
SALAMANDERS
FROGS
TOADS
AMPHIBIANS
LUNG FISH
BONY FISH
SHARKS, RAYS
FISH
INSECTS
SPIDERS
CENTIPEDES
CRABS
ARTHROPODS
LAMPREYS
TUNICATES (SEA-SQUIRTS, SALPS)
OCTOPUS
SNAILS
OYSTERS
MOLLUSCS
LEECHES
EARTH-WORMS
SEA-URCHINS
STAR FISH
SEA-LILIES
ECHINODERMS
WORMS (FLAT, ROUND)
JELLY-FISH
SEA-ANEMONES
CORALS
COELENTERATES
SPONGES
PROTOZOA
SINGLE CELLED ANIMALS
PLANTS
PROTISTA

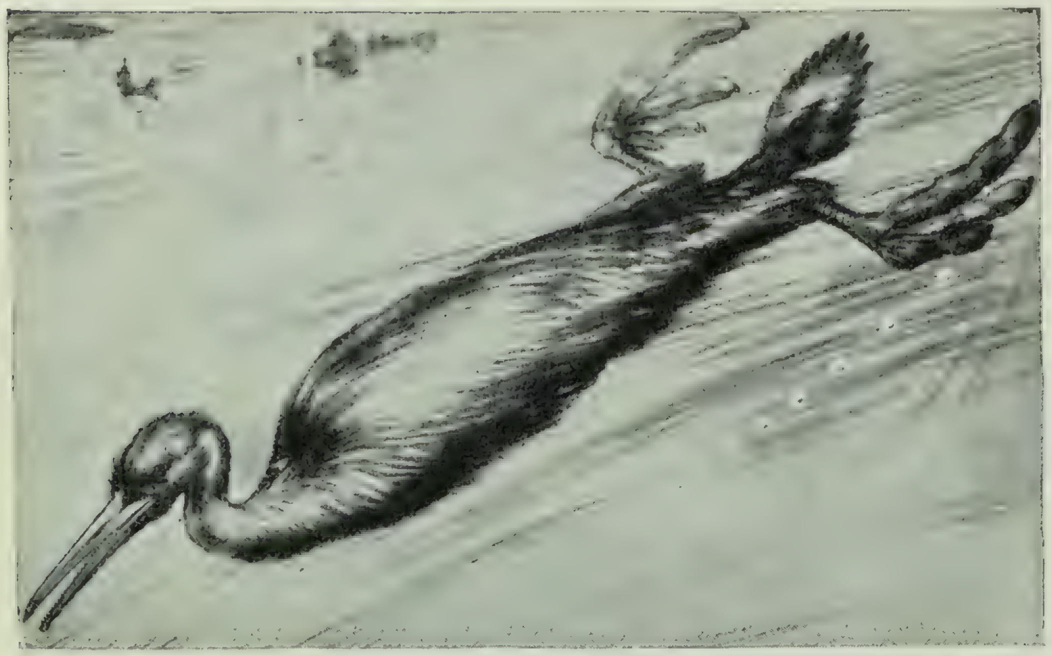
Begin at the base of this tree and follow its branches upwards. You will see how from the simplest forms of life there developed other forms. You begin with mere jelly-like specks of life and end, in the tree-top, with Man. There is a great gap, as yet unbridged, between Man and the nearest animal.

This was, perhaps, the first step towards life on dry land, and having made this first step these adventurous plants presently made another move forward. We all know how flowers will turn towards the light. The sun had by this time broken through the clouds surrounding the earth, and the sea plants, finding themselves in a region of greater brightness than when they had existed entirely under water, felt the same urge to reach up towards the light. But at first they could not do this. Immediately the tide receded, and they were deprived of the support of the water, they crumpled up. Again, however, the need supplied the means. The plants slowly began to develop hard tissue to enable them to stand without support, and in this tissue we see the beginning of wood.

So the first plants slowly invaded the land. They kept to the streams and marshy places, and after them followed the animals, so soon as they also had developed some means of retaining moisture.

Life developed rapidly once it had adapted itself to the new conditions, and the later Palæozoic Age saw all the swampy regions of the earth covered with luxuriant vegetation. Life, you see, though able to exist in the open air, still kept to the damp places, just as today there are animals and low forms of plant life which cannot exist away from water. This Palæozoic vegetation consisted of giant ferns which grew a hundred feet high and had trunks like trees, and similar growths, and it is the vast forests of this era which in the course of time became converted into coal.

In these great swamp forests there were no birds or flowers, and there was no such thing as a big land animal in existence. But there were snails, scorpions, spiders, and giant



From the giant reptiles came great birds. The one in the picture, the Hesperornis, had no wings and was a water bird. It was five feet in length.

dragon flies over two feet from wing tip to wing tip, and in the scum-covered water the earliest reptiles wallowed. This was the highest life so far developed by the earth.

Following the later Palæozoic Age came the *Mesozoic* ("Mid Life") Age, the age of giant reptiles. Life had advanced greatly by this time. No longer did it cling entirely to the swampy ground. Plant life was creeping upwards away from the water, but still there were no grass and no flowers, and though the plains were covered with thick vegetation, the highlands and mountains were still utterly bare. But there were real land animals, reptiles which had come up out of the water, and in the course of centuries had adapted themselves to existence on dry land. Some of these animals were of terrible appearance and immense size, as shown by their skeletons in our museums, and a walk through a Mesozoic jungle would have been a nightmare terrible beyond our imagination. About this time, too, the first birds appeared. They were really reptiles who had developed wings, and whose scales were in the process of becoming split up into the first feathers. These birds were probably sea-birds, and lived close to the sea.

THE GIANT REPTILES DISAPPEARED, BUT THE LOWLY LIZARD REMAINS.

For countless centuries the reptiles of the Mesozoic Age ruled the world. The Tyrannosaurus, the Stegosaurus, the Triceratops, the Brontosaurus and their kind were the lords of creation. They knew no foes except each other, and in all the story which the rocks have unfolded to us there is no sign of an enemy which might have led to their extinction. Yet the giant reptiles disappeared. In the history book of the rocks there are several blank pages, and when the story is taken up again the great reptiles have gone, so utterly gone that they have not even left descendants to carry on their kind. Tortoises, turtles, crocodiles, and a few lizards are all that have come down to us of Mesozoic life; all the rest of their great family were annihilated, and in the *Cainozoic* ("New Life") Age we are about to enter, their places have been taken by new forms of life. It would seem that Nature's experiment of living things with great bulk and little brain had failed. The later world dwellers, the mammals, were less, but had larger brains.

THE MAMMALS NOW BECOME MASTERS OF THE COLDER WORLD.

How did this great annihilation take place? Probably some vast climatic change came over the world, and the warm, humid conditions gave place to frost and cold in which the warmth-loving reptiles could not live, and in the next age we find the mammals, which all through the Mesozoic Age may have existed on sufferance and in constant danger from the great reptiles, developing into the rulers of the world, because they and they alone have been able to adapt themselves to the changed conditions.

In the *Cainozoic* Age, which is the page of history we come to after the blank pages following the Mesozoic Age, the earth had reached physical conditions not unlike those with which we are acquainted to-day. There were grass, and flowers, beech trees, holly, ivy, and many other green growing things with which we are familiar. It was also the age of mammals, by far the highest form of life yet developed by the earth. Man is a mammal, and he, with all the members of the class, possesses the *family instinct*. The parents realise their responsibilities and care for their young, and the young are capable of learning from their parents many things which enable them to overcome the dangers of existence. Brain, indeed, was beginning to develop, and in the Cainozoic Age we find the ancestors of many of our modern animals and insects. The pig, the rhinoceros, the horse, the deer, the elephant and the camel, monkeys, oppossums, hedgehogs, and several other animals, as well as bees and butterflies, have all put in their appearance. The first dogs appear, and the first cats, whilst running along the ground, climbing trees, and hiding amongst rocks was a small ape-like creature which was the Cainozoic ancestor of man.

EARLY MAN HID FROM WILD BEASTS UNTIL HIS CUNNING DEVELOPED.

The rocks tell us hardly anything of the early history of man. Perhaps this is because man's early ancestor was a timid creature very different from the ruler he is to-day. In those dim ages of the past, man had not developed the brain which alone has given him mastery over the animals, and being so much weaker and smaller than the animals, he must have led a very precarious existence. It was danger, no doubt, that kept him away from the low, marshy lands where animals abounded, and in which their numerous remains became buried and fossilised. Early man probably lived in the bare open, hiding behind rocks and in caves, and this is perhaps the reason why we do not find his fossilised remains mixed up with the remains of the animals which inhabited the same world.

Whatever the reason, all that we know of man for hundreds of thousands of years is derived from a few very primitive flint instruments, and from fragments of bones and skulls which may not be the bones of our ancestors at all, but the remains of apes which, though closely related to early man, were not in the direct line of his descent.

AGES LATER CAME THE MEN WHO MADE WEAPONS OF FLINT.

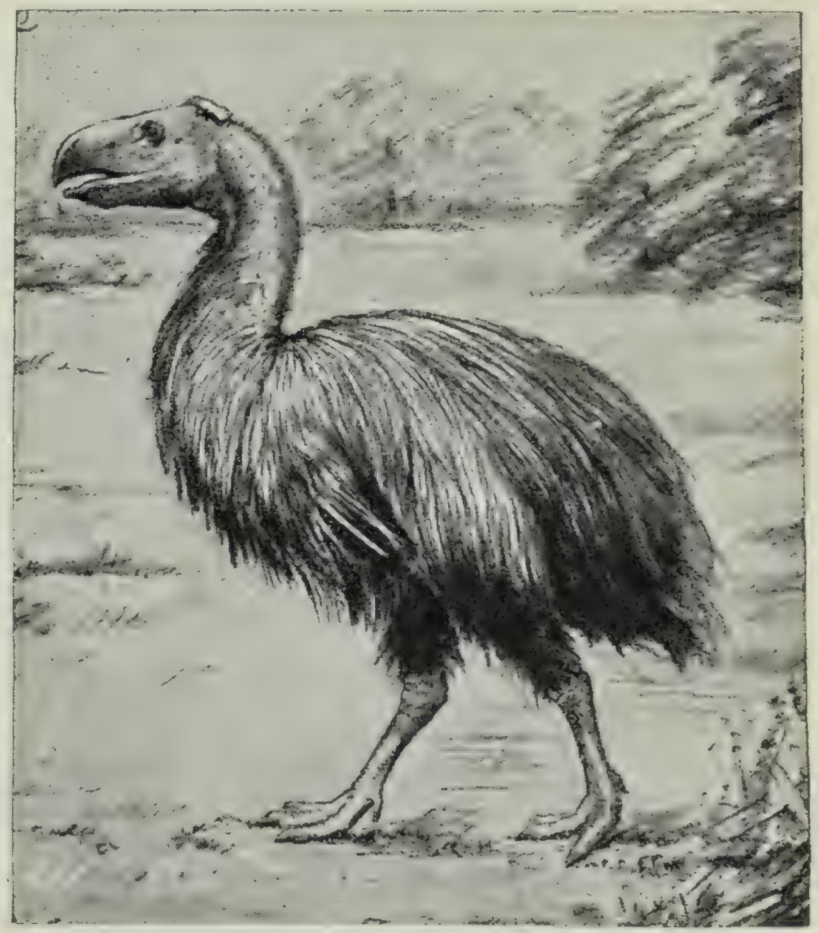
So we must jump some hundreds of thousands of years, years during which the mammoth, the bison, the sabre-tooth tiger, the hippopotamus, and the rhinoceros roamed the earth in company with our primitive ancestors, and no doubt made things very uncomfortable for them. In this period, also, the earth passed through a series of ice-ages, during which great areas of the earth, at present warm and temperate, lay for thousands of years under a covering of ice. These ice-ages were four in number. The first ice-age reached its height perhaps 500,000 years ago. Then, for a time, the ice receded, and temperate climate returned to the earth. But the ice returned, and a second period of great cold reached its maximum about 100,000 years later, whilst the third and fourth ice-ages were roughly 150,000 and 50,000 years ago.

Now it is in the time between the third and fourth ice-ages, and during the period of the fourth ice-age, that we begin to know something of a species of man. For the *Neanderthal* men were still not real men, and in course of time they became extinct. In appearance they were far below any of the primitive inhabitants of the world to-day. Probably they were hairy, with beetling brows, hardly any foreheads, and thick, ape-like necks—altogether very repulsive creatures.

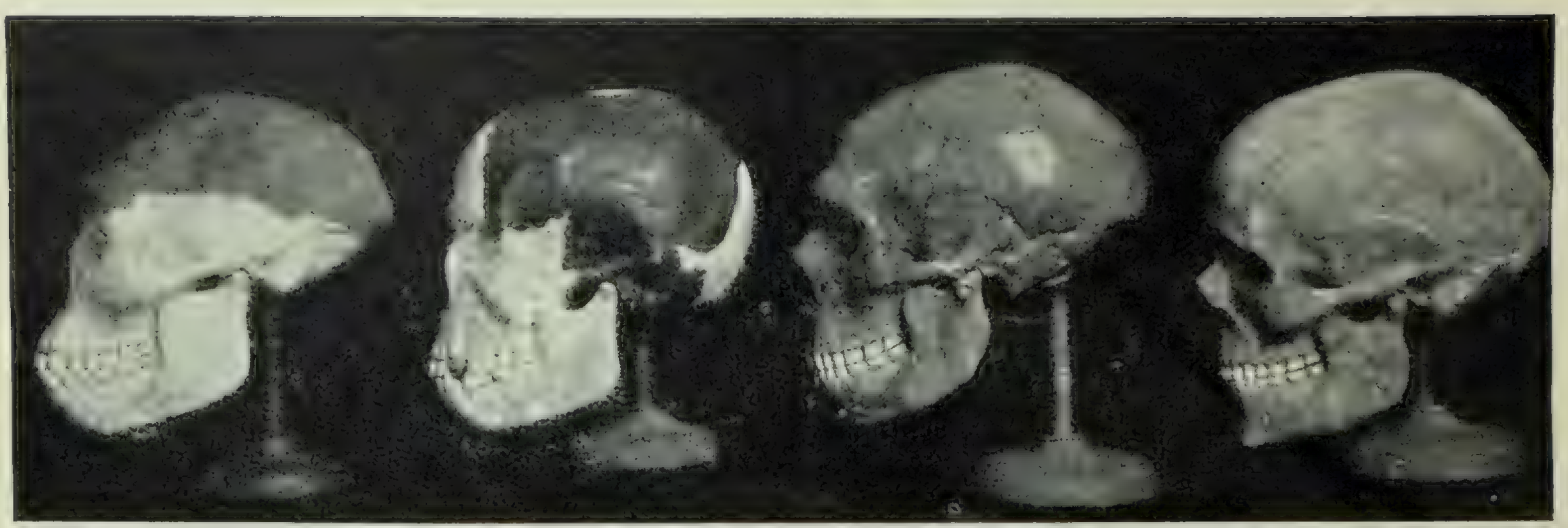
Yet these Neanderthal men were the highest creatures the earth had so far produced to our knowledge. They had learned the use of fire, and they worked in flint, shaping rough axes which were held in the hand and used without a handle, and stone scrapers. As the fourth ice-age advanced, and the weather grew colder, they must have taken to living in caves, before the mouths of which they no doubt lighted great fires to keep out the cave-lions and the cave-bears which roamed the country.

THESE EARLY MEN HAD STRONG CONSTITUTIONS AND STOMACHS.

They wrapped themselves up in skins as a protection against the cold. In their feeding they were not at all particular. If they found the rotting carcass of a mammoth or a cave-bear they hailed the find with delight. They did not turn against bad meat, neither did it make them ill. They ate fish, worms, birds,



At last land birds developed, though they could not as yet fly. This bird, the Diatryma, was heavier than an ostrich, though not quite so tall. Note its powerful beak.



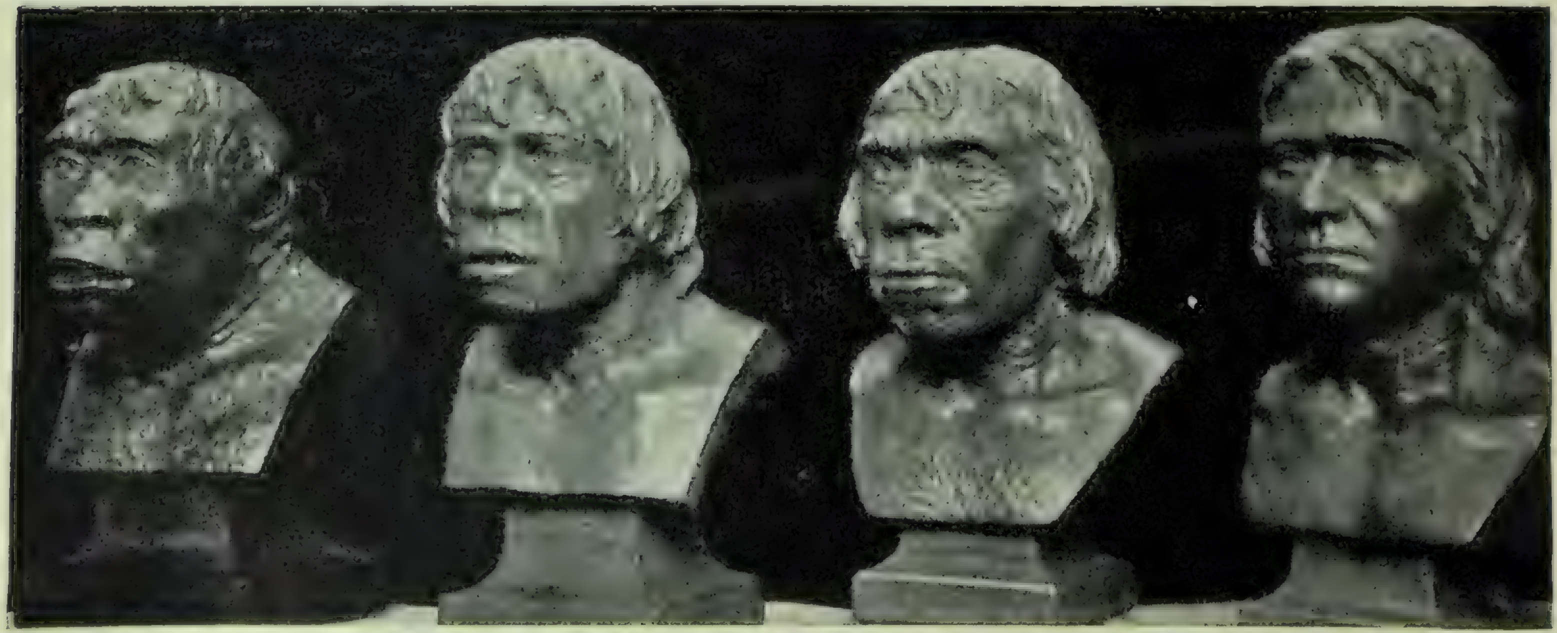
From parts of human skulls found in the earth scientists have been able to show how man has developed. The first skull shows the ape-man, the second the Piltdown man, Neanderthal man comes next, and lastly the real man.

rabbits and rats which they killed by throwing stones at them; nuts, crab-apples, and all sorts of fungi; anything and everything, in fact, which they could lay hands upon, and which was eatable. Neanderthal men and women had stronger digestions than we have to-day, and they did not suffer from ptomaine poisoning.

These people may have lived together in tribes, but more probably, at any rate at first, they lived together in families. A family would consist of a man who was lord and master of all, several women and children, and young girls and boys. When the boys grew up they went off, and founded families of their own. Probably they were driven away by the man, who would regard them with jealousy once they reached manhood. Some of them, no doubt, resisted and were killed, until one day, when he was getting old, the man got the worst of a fight, and the victor took his place as the head of the family. It could not have been a happy family life. Finer feelings were unknown, and the whole time must have been taken up in finding food, and gathering fuel for the all-important fires. It was a life in which only the fittest survived, and for them existence was one long battle.

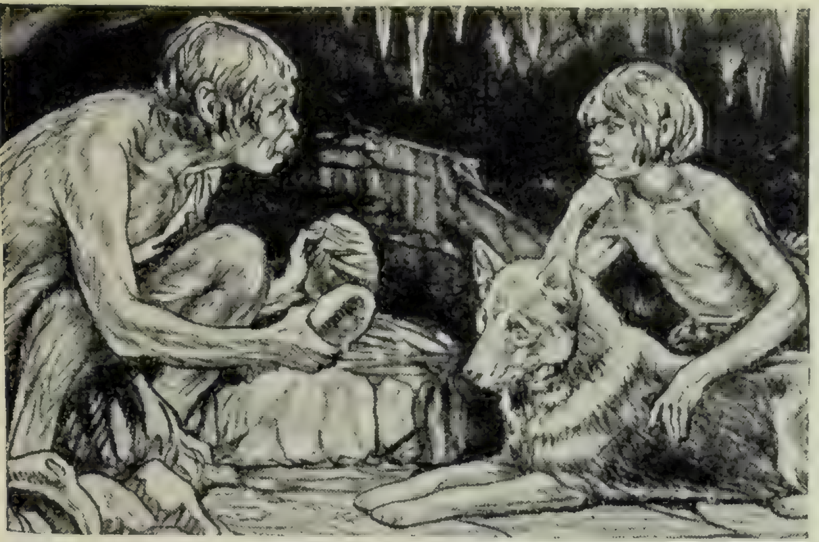
These Neanderthal men were the only men we know of in Europe for many thousands of years, and the age in which they lived is called the *early Palæolithic* (or "Old Stone") Age. Then somewhere between 35,000 and 40,000 years ago a new type of men appeared. They came perhaps from Africa or Asia, and in course of time they dispossessed the Neanderthalers so utterly that the latter disappeared from the earth. These new men were called *Homo sapiens*, real men, because in them we do at last find true men, and the age in which they lived is called the *later Palæolithic* Age.

These real men were a very different race from the Neanderthalers. They were tall, and their brains were already well developed. They were great hunters, and instead of waiting for the larger beasts to die or get caught in a bog,

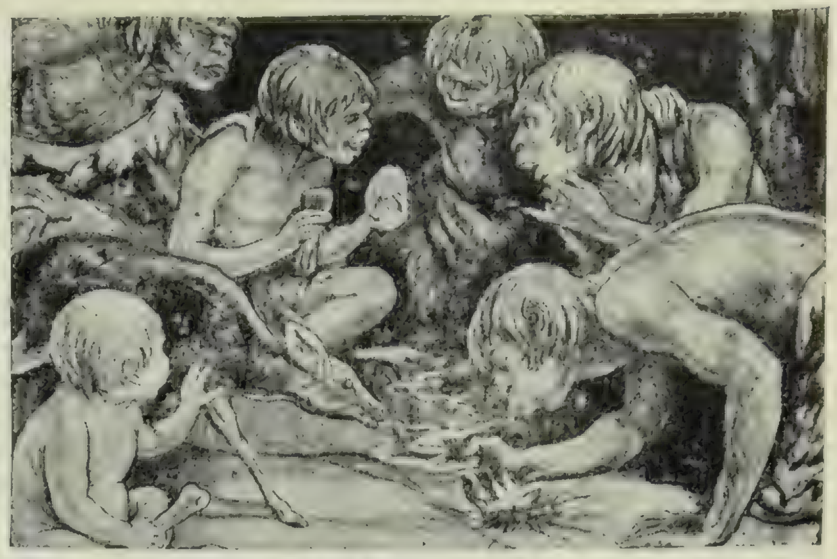


Using the measurements of the above skulls as a guide, a sculptor has produced portraits of the four types of men. Note how, as man progresses through the ages, his jaws go back, while his forehead comes forward and becomes higher.

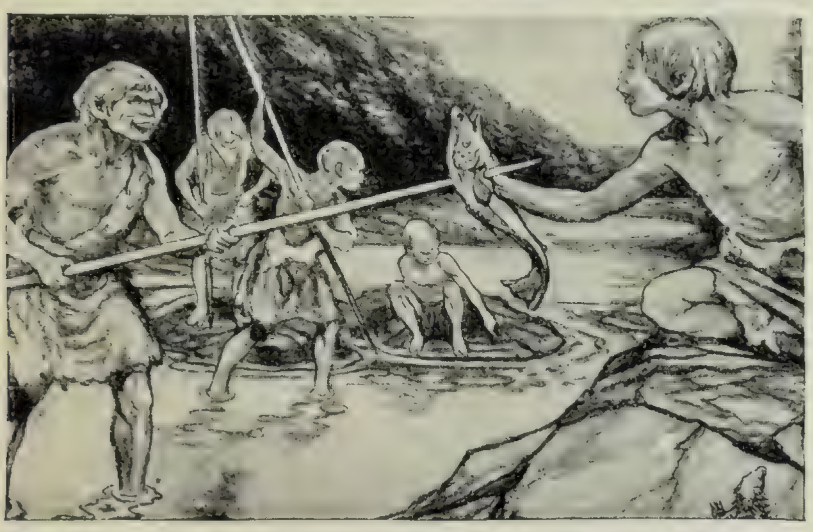
PEEPS INTO THE LIFE OF EARLY MANKIND



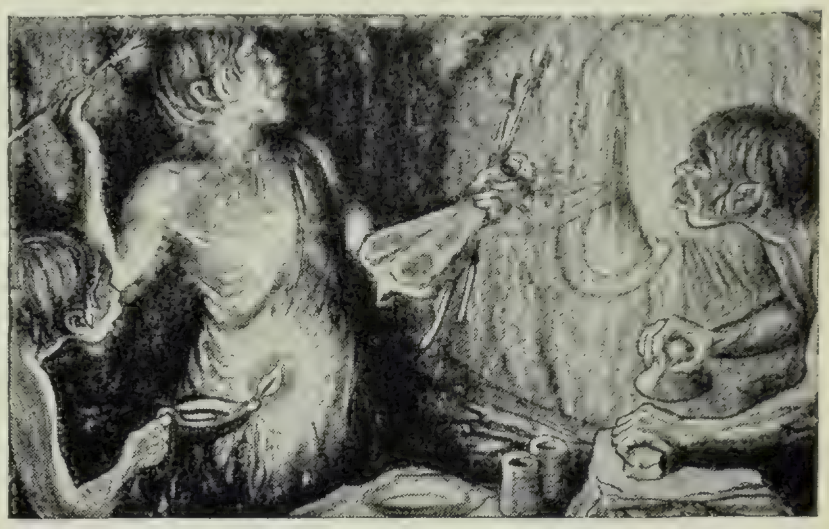
Early man soon learned how to split flints with which to make sharp weapons. These tools assisted him in hunting.



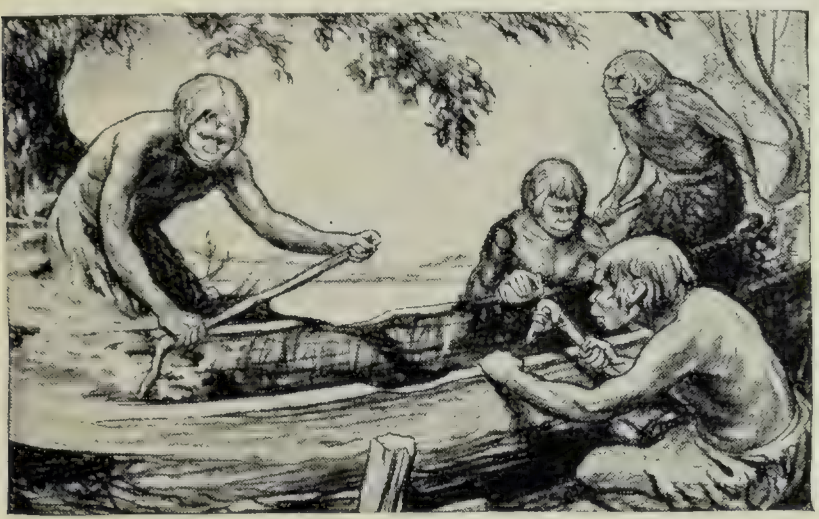
Then some clever man discovered the art of making fire, and this command over flame gave him warmth and light.



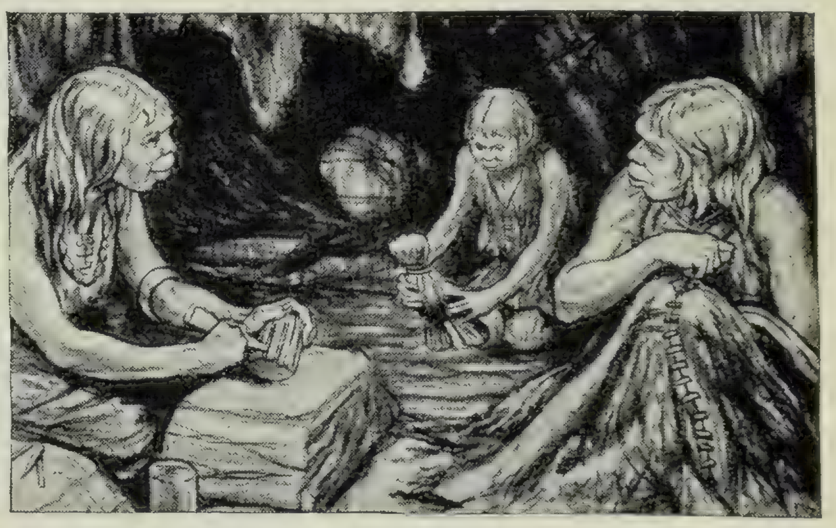
He often found his meal by wading into the lakes and rivers, armed with sharp pointed stakes for spearing fish.



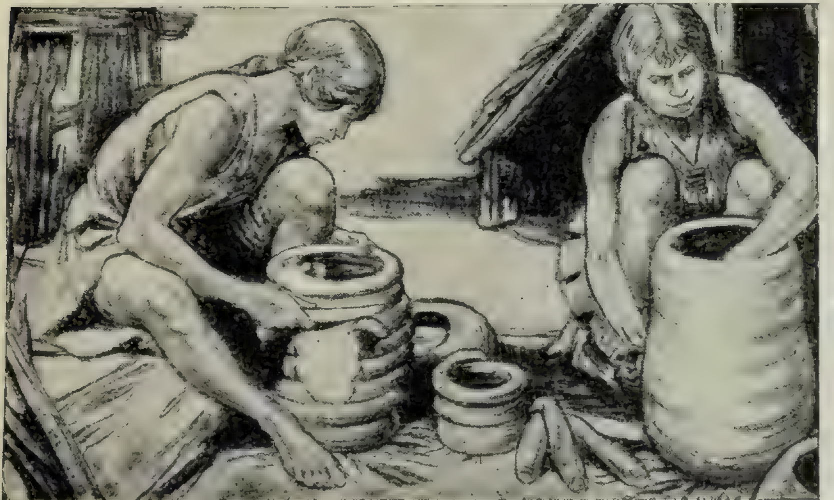
Soon artists arose among these simple folks. On the walls of their caves the men painted pictures of wild animals.



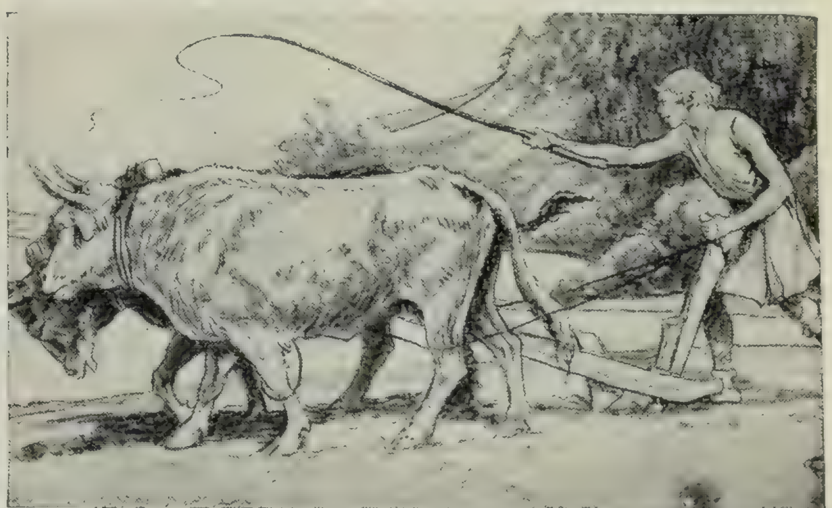
The waters called him, and he dug out with great patience from the trunk of a tree a useful boat.



As man developed he realised the need for clothing, and his womenfolk made their needles by cutting splinters of bone.



Later our forefathers learned to enjoy cooked food. They found out how to make cooking and drinking utensils of clay.



Now the stage of wild hunting passed, and we see man settling down to grow his food on the land.

as the Neanderthal men had done, they hunted the mammoth and the bison. They made flint knives, harpoons of reindeer horn, spear-heads, and above all, they drew.

HOW THE FIRST ARTISTS PAINTED THEIR PICTURES.

On the walls of their caves they painted pictures of the animals they hunted, pictures which may still be seen in some of the caves in which they lived. They carved in stone and ivory, and many of their carvings represent a high degree of skill. There are horses' heads, carvings of reindeer, bears, mammoths, and there have even been found little human statuettes carved in stone. These real men, indeed, were a great advance on the Neanderthalers, but they were still savages. The climate was warmer now, for the fourth ice-age was passing away, so probably they went naked, covering their bodies with coloured paint. They had not learned to build, they knew nothing of agriculture, and though they made little figures of clay they never used it to make pottery. So they persisted for perhaps 25,000 years, and then they in turn had to give place to an invading race. This race was a white race, and it also probably came from Asia. We call it the *Neolithic* race, and in it we find at last the actual ancestors of the modern European races.

THE Neolithic men lived in an entirely different manner from the real men. Somewhere they had become more civilised. They had invented bows and arrows, and made beautiful, polished flint arrow-heads which they lashed to the shafts with thongs of hide. Their axes, too, had handles, and though when we first know them they are still hunters, they had also developed some sort of agriculture. Later, agriculture became their chief occupation, and they cultivated wheat and barley which they ground and made into bread.

Neolithic men were the first men to tame animals for domestic use. They tamed the dog, sheep, goats, and cattle, and at nightfall these animals were probably driven inside their dwellings to protect them from beasts of prey. Neolithic men, you see, did not live in caves as their predecessors had done. They built huts, and sometimes they built them on piles standing in water, as a protection against animals and other enemies. These huts we call lake-dwellings, and there are races living to-day in huts exactly similar to the lake-dwellings of the Neolithic men.

ANOTHER thing in which the Neolithic men out-distanced the real men was in the way they prepared their food. The real men, if they cooked it at all, had only scorched their food, but the Neolithic men had earthenware cooking utensils, and ate properly cooked food. Also, they wore clothes, at first made of skins, but later made from a rough cloth of woven flax.

As time went on they discovered the use of metals. Gold they used for ornamental purposes. Then they discovered copper, and later bronze, which is copper and tin mixed. This discovery led to their making weapons of metal, and their old axes and arrow-heads of flint gave place to arrows and axes of bronze. It was during this age—the Bronze Age it is called—that Stonehenge was built. Now Stonehenge was a sort of temple, a pagan temple, it is true, but still it shows that the Neolithic men had vague ideas of spiritual powers higher than themselves. Stonehenge was erected between 3000 and 4000 years ago by men who, though much less civilised, were not so very different from ourselves. Man had, in fact, grown up. He was no longer a half-ape-like creature, but a true man whose brain had already made him master of the earth. Since those times there have been wars and pestilences, but the race has never disappeared as the Neanderthal men disappeared, and we who live to-day are the direct descendants of those Neolithic men and women of thirty centuries ago.

England's oldest monument is Stonehenge, where temples of stone, erected during the Bronze Age, have stood for 4000 years.

Under the snow-clad peaks of the mountains at Banff, Alberta, bison move about in safety, protected by law. [*C.P.R.*

OUR WONDERFUL WORLD

It is a fascinating world in which you are beginning your lives, a world made up of many races of people, of different colours, habits and customs. Some collections of families are grouped in home-made huts, while others herd together in cities where the only space to build is skyward. Here tenements and skyscrapers rise above the ground. Some people obey man-made laws, while others obey only the law that says the fittest shall survive. In this medley of the wonderful and the curious you will live your lives, and to live them well some knowledge of other lands and their peoples is necessary. The pages that follow give you glimpses that will make you desire to find out more about the lands afar.

IN spite of modern civilisation, there are races in existence to-day who live as our ancestors lived 25,000 years ago. When the British first discovered Australia, the natives or aborigines were still living in the Stone Age. They knew nothing of metal, and their weapons consisted of spears, clubs, and a curved throwing stick called a boomerang. They were acquainted with fire, which they made by rubbing two sticks together, but they had not invented bows and arrows, they knew nothing of agriculture, and they wore no clothes except a few skins in cold weather.

Yet even though they were so ignorant these Blackfellows were magnificent hunters. They had to be. In Australia there are vast tracks of almost lifeless desert, and, as starvation was the certain lot of the poor hunter, hunting became the Blackfellows' chief business. They knew every habit of the animals they hunted and could imitate their cries so as to deceive the very creatures themselves. Ages ago, no doubt, they discovered that the emu is a very inquisitive bird and accordingly the Blackfellows hunted the emu in pairs. One of them would bury himself up to the waist in the ground, and then cover the exposed part of his body with an emu skin, whilst his companion hid himself close by in a clump of bushes. When everything was ready, the man in the bushes would start making the cry of the emu, whilst his companion waved his head and body about in all sorts of grotesque motions. If there were any emus within hearing they would be attracted by the cries, and when they saw what appeared to be an emu contorting itself on the sand their curiosity compelled them to draw near and investigate. Whereupon some of them would be speared and the hunters would return rejoicing.

The Blackfellows could detect the presence of reptiles by watching the behaviour of birds, and they supplied themselves with honey by catching a bee, attaching a piece of fluff to its body, and then following the insect to its hive. Yet, for all their skill, there were times of want when they were thankful to eat grubs, ants, moths and roots, in fact, anything eatable.

But though it is true that most of a poor Blackfellow's life was taken up with finding food, he nevertheless had his primitive amusements. The chief of these was the corroborree or native dance. Sometimes the dance represented the hunt, and the dancers, their painted bodies gleaming in the firelight, would go through all the stages of tracking, finding, and making the kill; at others they acted a fight between two tribes, and all the incidents of battle were shown with hideous realism.

A Pygmy African Bushman. The freedom-loving people of the African Bush are seldom more than five feet in height. They are clever hunters and delight in drawing and story-telling.

THE Blackfellows of Australia are dying out. Civilisation does not agree with them, and only in the tropic areas of Northern Australia do we find these primitive people living as their ancestors lived hundred of years ago.

Another primitive race is the Bushmen or pygmies of Africa. Bushmen are passionate lovers of freedom, which is perhaps why it is so difficult to civilise them. Like the Blackfellows, they make fire by rubbing two sticks together, and they live in rude huts, or holes in the earth.

These pygmy African people live by hunting, and their chief weapon is the bow and arrow. Their arrows are poisoned, and the slightest wound would kill the largest animal in a few hours. So fleet of foot are the Bushmen that sometimes they will actually run down an animal and kill it, and when they have made a kill they have a feast. They are great eaters, these small people, and half a dozen of them will sit down to a zebra, and not leave off eating until they have finished him.

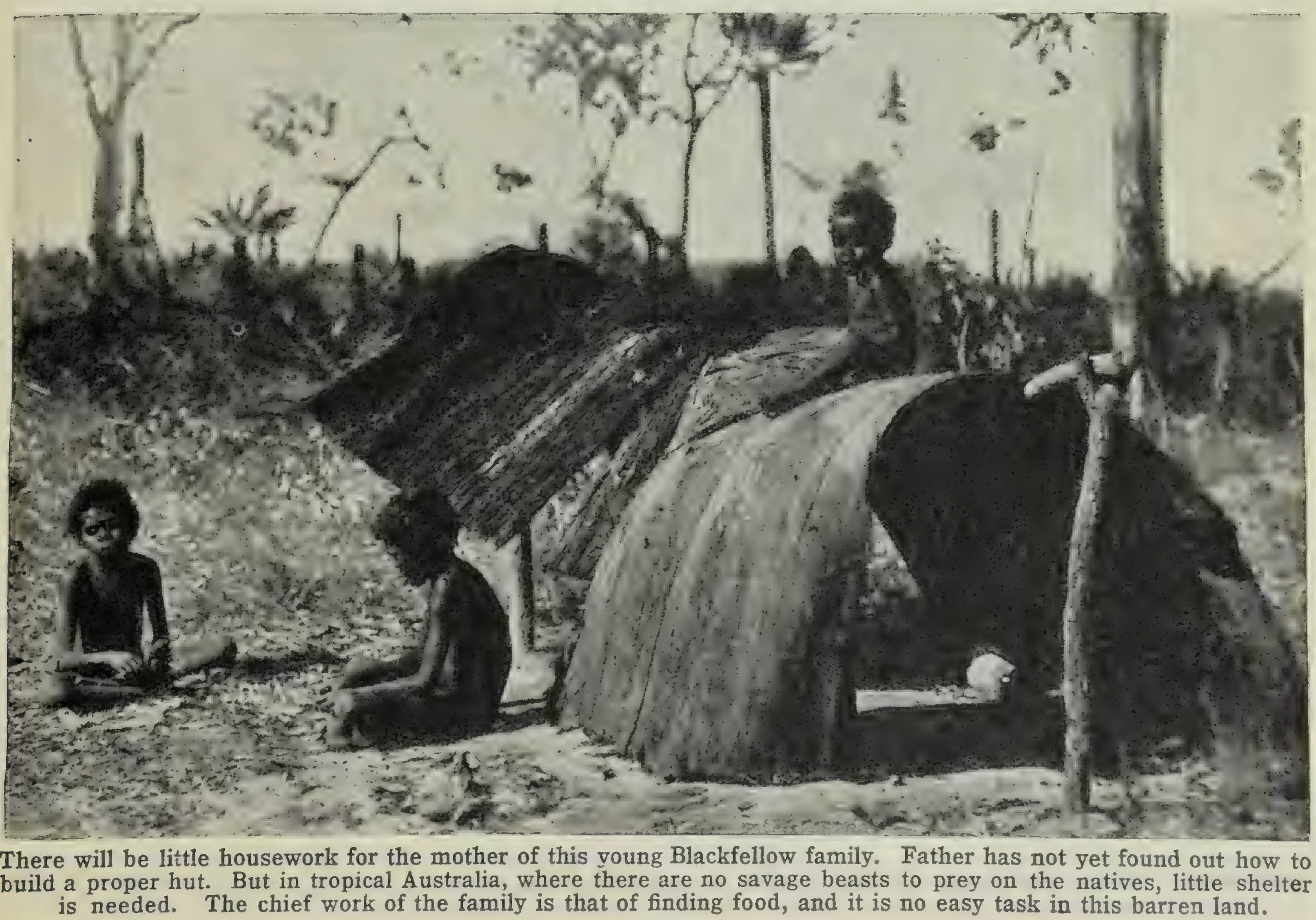
Knowing nothing about farming, they eke out their animal food by digging up roots. Their pottery consists of ostrich eggs which they use to store and carry water, and they wear hardly any clothes. In one direction, however, they have advanced farther than the Blackfellows. The Bushmen can draw. Like the Real Men, they are fond of decorating the walls of caves with paintings of animals, men, and women, and their pictures are rendered in four colours, black, white, yellow and red. They also have a great number of legends connected with animals, and the sun, moon, and stars. They know many of the constellations by sight, and have given them names of their own. Orion they know, and the three stars which form Orion's Belt they call " three she-tortoises hanging on a stick." The Bushman also is fond of music, and has a primitive instrument made out of a hollow gourd and a few strings.

There are several of these primitive races in different parts of the world, races which stopped short thousands of years ago, and have made no further progress. Such races often die out when brought into contact with civilisation, so it would seem as though civilisation is a thing which has to be learned slowly.

The Blackfellows also perform very curious and even painful rites when they admit a youth to the dignity of manhood. One of the tests under which the young man has to go is that of fire. A fire of twigs and branches is made, and when this is burning out, and the smouldering embers are belching forth their smoke, the youth must lie in their midst, and stay there for a specified time without shrinking or complaining, while the hot and burning wood sears his skin. If he survives the terrifying ordeal without flinching or showing a coward's heart, he becomes a fully qualified member of the tribe.

THESE poor, ignorant people have queer ideas of beauty, and will suffer much pain to achieve that state of perfection. They cut gashes in their flesh and then, when the wound is almost healed, tear it open again. This process is repeated until the wound eventually heals leaving a raised weal of flesh. These weals form lines or designs on the chest or limbs. Imagine a Blackfellow, or woman, so disfigured, and with the eyebrows and front hair plucked out by the roots, and you will feel sorry that these poor savages know no better means of " improving " their appearance. It must be remembered, however, that various peoples have different ideas of beauty.

This Australian Blackfellow is not as miserable as his scowl suggests. He is merely wondering what the photographer is doing with his " box of magic." Note the long spears used by the Blackfellow when he goes hunting. He has no rifle, no knife, nor even a bow and arrows. His curved wood boomerang, however, is a sure weapon.



There will be little housework for the mother of this young Blackfellow family. Father has not yet found out how to build a proper hut. But in tropical Australia, where there are no savage beasts to prey on the natives, little shelter is needed. The chief work of the family is that of finding food, and it is no easy task in this barren land.

THE WORLD'S COLOUR BOX OF PEOPLE

HIGH above the Arctic Circle, clinging closely to the coast of Greenland and the northern shores of Canada, is a race of people called the Eskimos. They are a very ancient race, probably derived from the same stock as the Chinese, and far back in the dawn of history they were living the same hard, primitive life which they are living to-day. The Eskimos have no coal fires to keep them warm, no sheep to supply them with wool, and they grow no corn from which to make bread; yet, without any of the comforts which more southern people enjoy, these people of the far north find amongst their frozen wastes all the necessities of life to keep them healthy and strong and happy.

AFTER THE KILL, A SEALSKIN BLADDER SHOWS HUNTER WHERE HIS QUARRY IS.

These people of the far north are great hunters, and most of their food comes from the sea. For weapons they have a bow made out of the rib of a whale, arrows, spears, and harpoons. The latter have detachable points to which the Eskimos tie sealskins filled with air. When the quarry is struck, the point comes away from the shaft, but the sealskin float keeps it from being lost, and not only shows the hunter where to find his kill, but prevents it from sinking beyond his reach.

In the winter, when the northern seas are completely frozen over, the Eskimo has to make a hole in the ice before he can fish. Sometimes he lies down, peering into the hole, and catches his fish on a harpoon. [*E.N.A.*

With such primitive weapons the Eskimos go courageously to hunt the whale, the walrus, and the seal. They have no big boats. The boats of the Eskimos are tiny canoes, called kayaks, made of sealskins stretched on frames of wood or whalebone. Each man has his own kayak, and he sits in the canoe with his body protruding through a hole in the skin deck. When afloat the Eskimo ties a waterproof skin round the top of this hole and also round his body so that the little craft is absolutely watertight, and so skilful are the Eskimos in handling their kayaks that a clever paddler can turn a somersault right through the water, canoe and all, without shipping a drop of water.

The Eskimos eat fish, birds, roots and berries, but their chief food consists of reindeer, seals, and whales; indeed, without these animals the Eskimos could not exist. Reindeer and seals supply the skins out of which they make their clothes, whilst the blubber of the whale is used both for fuel and for cooking purposes.

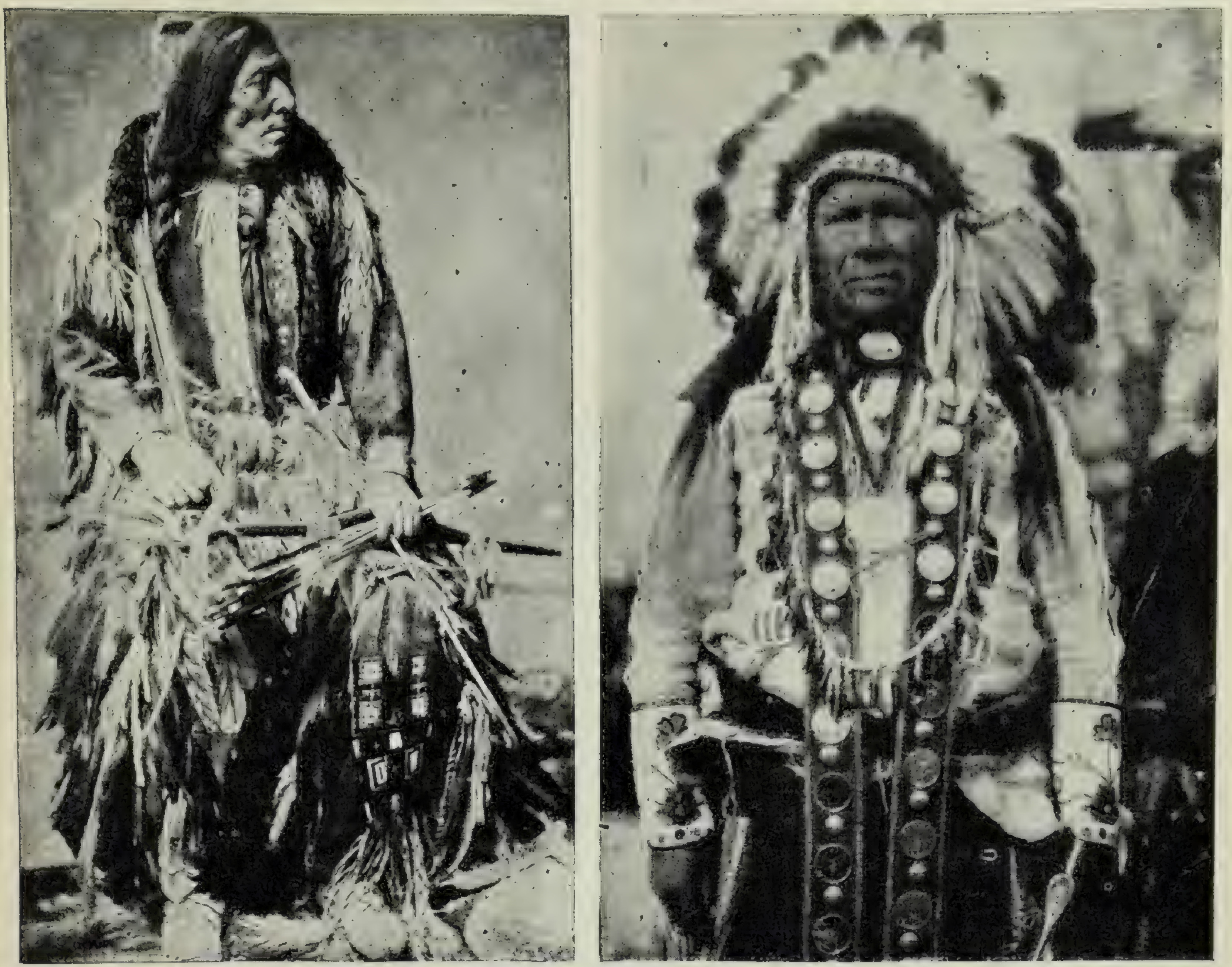
Their land is the country of the midnight sun, and for many weeks in the summer the sun never sinks below the horizon and there is constant day. At such times the Eskimos live in tents of reindeer or sealskin, but in the long winters, when the sun is never seen and the temperature sinks far below freezing point and the blizzard howls over the frozen wastes, they live in stone huts half buried in the ground and only reached by long passages so low that they have to crawl on hands and knees. Sometimes, however, there are no stones with which to build the hut; then these ingenious people cut blocks of hard, frozen snow and build them into a hut which soon becomes a solid dome of ice and will keep the family snug and warm all through the coldest weather.

INSIDE THE HUT IS LIGHT AND WARMTH THROUGH THE MONTHS OF DARKNESS.

There is no room for a fire inside these huts. Warmth, light and heat for cooking are all supplied by primitive lamps burning blubber, and even in the coldest weather the inside of an Eskimo hut is often intolerably hot. The Eskimos are great eaters, and when food is plentiful a man will eat as much meat in a day as would keep an Englishman for a week

Eskimo men and women dress alike, and their clothing consists of a jacket and trousers

THE RED MEN OF AMERICA TO-DAY



The great chiefs of the Indians belong to a dying race. Those who remain are civilised or live with their people in special tracts called "reservations," where they are allowed to follow their own pursuits unmolested. On the left picture you see a Blackfoot Chief. On the right stands an imposing chief of the Sioux tribe with eagle-plume head-dress.

This peaceful scene shows American Indian Reserve in Alberta, Canada. Here the Indians have been taught farming, and they live in houses like those of the white man. At first the Indian warred against the white hunter who came to capture buffalo for the sake of the hides. Now his numbers have diminished and he is glad to keep the peace. [*C.P.R.*

which they tuck into sealskin boots. The women have a sack at the back of their jackets in which they carry their fat, smiling babies. Eskimos, by the way, rarely wash. Sometimes a mother will lick her baby, but that is usually the nearest approach to a wash that an Eskimo gets from the day he is born to the day he is buried.

THE ROMANTIC REDSKIN OF NORTH AMERICA: A DYING RACE WITH A THRILLING HISTORY.

The American Red Men of to-day are wholly or partially civilised and no longer go on the war-path as they did in the "good old days." Once the Indians were a free and haughty race, living in the great forests and on the vast plains of North America. Hunting, fishing, and war were the only occupations considered worthy of a man, whilst the women tilled the fields in which they grew maize, pumpkins, and tobacco, and did the hard work.

Before the coming of the white men, to their land, the Indians knew nothing of the use of metal. Their weapons consisted of bows and arrows, hatchets of stone and shell knives. Wandering bands, such as those that roamed the great prairies of Canada, lived in pointed tents made of the skins of buffaloes, but the more settled tribes inhabited villages composed of large huts called "long houses," each of which held several families. These villages were surrounded by wooden palisades, loopholes for arrow shooting, and with platforms on the inside upon which piles of stones were kept ready to throw down upon the heads of enemies trying to force an entrance.

It was from such places as these that the Indian braves started forth on their forays against the white settlers or hostile tribes. When war had been decided upon, messengers were despatched to all the villages of the tribe calling the warriors to arms. Then began a time of fasting and praying to the Manito, the "Great Spirit," for success. Wise men were consulted to explain the meanings of dreams and omens, and finally, on the evening before the expedition started, there came the war-dance in which all the warriors, painted and feathered for war, took part. Then, early the next morning, the party stole silently away into the forest upon its mission of death and destruction.

In their birch-bark canoes the Sioux Indians often went fishing on the rivers and lakes of Dakota. Their numbers in recent years have greatly decreased.

The game of Lacrosse was a vigorous all-day game with the redskins. But the Red Men were not always engaged on hunting or war. They played games, and chief of these was Lacrosse. Lacrosse was "big medicine" with the Indians, and was a much fiercer and more strenuous exercise than the game we play. If a district were suffering from famine or pestilence, a game of Lacrosse would often be ordered by the medicine-men as a cure. The warriors of the tribe were the players, and on the day fixed the two sides formed up opposite each other, sometimes several hundred strong. Then came a solemn dance, after which the ball was thrown into the air and the game began. Often a game lasted all day without a goal being scored, which is not surprising when we know that the goals were sometimes a mile apart, and that the players used their heavy, netted sticks as clubs, breaking arms and legs and sometimes killing or maiming each other for life.

THE RED MEN WROTE IN PICTURES WHICH EXPRESSED THEIR THOUGHTS AND DESIRES.

The Red Men of North America possessed no written literature, but they had a vast store of legends which were handed down by word of mouth from generation to generation. Their nearest approach to writing was their picture-writings and the wampum belts with which they recorded important events. These belts were made of beads worked into different patterns, and they were kept by certain old men of the tribe who were supposed to be able to read them, and remember what they meant. Thus, when two tribes made a treaty with each other, each clause in the treaty was represented by belts of wampum which were solemnly exchanged by the contracting parties, as nations to-day exchange pieces of parchment signed by their representatives.

Nowadays the Red Men are civilised, or else live on special grants of land called reservations. As a race they have not taken kindly to civilised life. To thrive, they need their

Chairs are unnecessary when tea is taken in this land of blossoms, for the low table provides seating accommodation for the mother and her charming daughters.

ancient, untrammelled freedom of forest and plain, and to-day the Indians of North America are a race of people who are slowly dying out.

THE Japanese are the leading representatives of the yellow races in the world today. They are a wonderful people. As recently as 1853 they were still living the primitive life they had lived for centuries, untouched by western civilisation ; then, one day, a fleet of American warships appeared and dropped anchor off the coast of Japan. They had come to demand satisfaction for the ill-treatment of certain American sailors, and for the first time the Japanese realised the power of the west. There was nothing for the Japanese to do except submit to the terrible strangers, so treaties were made, and for the first time in history the ports of Japan were opened to the trading ships of the world.

But the Japanese had learnt their lesson. They had seen the might of the west, and from that day they determined to become westernised, to make themselves the equal of the great white nations, so that never again should they find themselves helpless under the guns of a foreign power. It required an immense effort, it meant practically the remodelling of the whole of their national life, but they succeeded, and to-day Japan is one of the foremost nations of the world.

But though the Japanese have become westernised they still retain their national characteristics. They are intense lovers of beauty, and flowers are almost objects of reverence to the Japanese. April, when the cherry tree blossoms, is a time of high festival, and no home is found without its decoration of flowers. So it is all through the year. Every month brings its fresh flowers to gladden the hearts of these lovers of nature, until the chief glory of the year is reached in the autumn when the chrysanthemums are in blossom.

THIS same spirit is seen in Shintōism, the Japanese national faith. This religion teaches the worship of nature and reverence for the dead, and to it the Japanese owe their courage and that undying love for their country which will cause the meanest to lay down their lives unhesitatingly if by so doing they can benefit the homeland.

The Children's festivals in Japan are red-letter days long to be remembered. In no country do the children receive more consideration than in Japan. Each year on March 3 the Festival of the Dolls is held. This festival has

Children in Japan have a happy time. Every year festivals are held in their honour—the Feast of Flags for the boys on May 5, the Festival of the Dolls for girls on March 3.

India's army keeps watch day and night against the savage hill tribes on its north-west frontier. The Indo-Afghan seen here is quick of eye and sure with his rifle.

been held for 1400 years, and, in every household where there are girls, the dolls which have belonged to the family for generations are all brought out and set up in a special room. Then the girls make cakes, cook rice, and brew a sweet wine, all of which things are laid out before the dolls. When everything has been prepared, the girls put on their best clothes, and call upon each other and receive their friends.

THE FEAST OF FLAGS IS THE BOYS' RED-LETTER DAY.

The boys also have their festival, which is called the Feast of Flags, and is held every year on May 5. On that day the streets and houses are decorated with flags, and every boy is given tiny figures of the great national heroes, and ancient spears, swords, and bows and arrows, which have been handed down in the different families from one generation of boys to another, are brought out and displayed. This festival is intended to make the boys patriotic and brave, just as the Festival of the Dolls is intended to make the girls womanly, and to teach them the beauties of home life.

Elegancy and efficiency mingle in this land of earthquakes and industry. Japan is a land of earthquakes. Scarcely a day passes without a shock, and for this reason most Japanese houses are lightly built of wood, with light, sliding partitions instead of dividing walls. There is little furniture in a Japanese house. A few pictures hang on the walls. There are beautiful flowers in porcelain vases, and mats upon the floor on which the inmates sit. At night, thick quilts are taken out of cupboards and laid on the floor, and these, with other quilts to cover them and wooden pillows for their heads, are the beds upon which the Japanese sleep.

Japan has been called the Britain of the east, and certainly its people display the same indomitable spirit which has made our nation what it is to-day. In manufactured goods they now challenge the industrial nations of Europe, and cheap articles formerly "Made in Germany" are now marked "Made in Japan."

INDIA—THE ENCHANTING LAND OF MANY RACES AND LANGUAGES.

In all hot countries we find sun-tanned people. India, land of many races, possesses a civilisation older than our own ; yet, in spite of this, the bulk of her people are still sunk in ignorance. This is partly due to the "caste" system of the Hindus, which keeps a man from rising above the station into which he was born. A caste is a group of people who follow the same trade, or hold certain religious beliefs, and each caste is separated from all other castes by strict rules regarding food, marriage, and other details of life. There are about three thousand castes in India, and for a Hindu to break his caste is a very serious matter, and he has to undergo long ceremonies of purification before he can regain his lost position.

India, you see, is not such a free country as our own. The women are usually kept in strict seclusion, and a man born in a caste remains in that caste all his life, and no amount of hard work or learning can raise him to a higher caste. The vast bulk of the people are agriculturists, but there are warrior races like the Sikhs and Rajputs who form a large part of the Indian army. This army is partly officered by British officers, and day and night it keeps watch along India's turbulent north-west frontier. Were it not for this sleepless watch, the savage hill tribes would pour down from their valleys,

There are many places in warmer lands where water is scarce. Here the camel is used as a water carrier.

and the fertile plains of India would again become the battle-ground of contending races.

The warlike Arabs are still another dark-skinned race. Some live in cities or villages built of dried mud, but the Bedouins, or roving Arabs, live in goat-skin tents which are easily moved from place to place as the tribes roam about in search of pasture for their herds. Each tribe has its sheik, who is always ready to lead his clan to the plundering of some passing caravan should fortune bring one within their reach. The Arab women are as brave as the men, and not very long ago, when two Arab clans went to war, the contending forces were each led by a brave girl of the tribe mounted on a black camel. As these girls rode into battle, they sang warlike songs to encourage their clansmen, and round them the fight always raged fiercest. If one were killed it usually meant the utter rout of her tribe, whilst the maiden of the conquering clan led her warriors back in triumph.

THE DARK-SKINNED ARABS WHO LAZE IN THE BLAZING SUN.

Strangely different, however, is the life of the Arabs, living in their hot, dry country, to that of the Polynesians who inhabit the tropic islands of the Pacific. These are, indeed, a happy, care-free race. The warm climate and the rich soil together provide almost all their wants. They never have any winter. A loin cloth for the men and a girdle of leaves for the women are all the clothes that are needed, and often these handsome people may be seen bathing and disporting themselves in the warm sea. Nature has done so much for these happy folk that they are inclined to be lazy. There is not the need to be up and doing to keep body and soul together that there is in more northerly lands, and perhaps that is one reason why the white races of the world have climbed so much higher in the scale of civilisation than the earth's sun-tanned people.

THE POWER OF THE WHITE RACES WHO DOMINATE THE WORLD.

In the present age the white races are the rulers of the earth. They are divided into three families known as the Teutonic, the Latin, and the Slavonic. The Teutonic races are the Anglo-Saxons, Germans, Danes, Swedes and Norwegians. To the Latin group belong the French, Spaniards and Italians, whilst the Russians and Poles are the chief Slavonic races.

These Slavonic races are generally less advanced than the races of the other great families. Their lower classes are still steeped in ignorance and they lack the initiative of the Teutonic or the Latin people. There is in many of them, also, a large share of eastern blood, so that the Slav races belong half to the east and half to the west. France is the foremost Latin nation, as Great Britain is the greatest Teutonic nation in the world. They are also the greatest colonial nations, and in the eighteenth century the French and British engaged on a long struggle for the possession of vast overseas territories in India and North America. That the British won was partly due to their greater gifts for colonisation. The ruling idea behind British colonisation has always been to develop the new country for the benefit both of the original inhabitants and the British settlers, whilst the French only saw in their colonies sources from which they might extract wealth to be used for the benefit of European France.

THIS gift for colonisation is one of the chief characteristics of the British. The Germans, our cousins, do not possess it. They lack the sympathy, the power to be both a firm ruler and a kind father which is found in the great British colonial administrators. It may be that we owe this gift to the Roman blood in us. The Romans were the other great colonising race of history, and we British are partly descended from the Romans, who occupied Britain for over four hundred years. Our position on an island has also contributed to this urge to conquer new lands. England was too small for the eager spirits of her adventurers, so they sailed away in little ships and founded settlements in new countries, settlements which have expanded into the great British Commonwealth of Nations, as well as into that other great Anglo-Saxon nation, the United States of America.

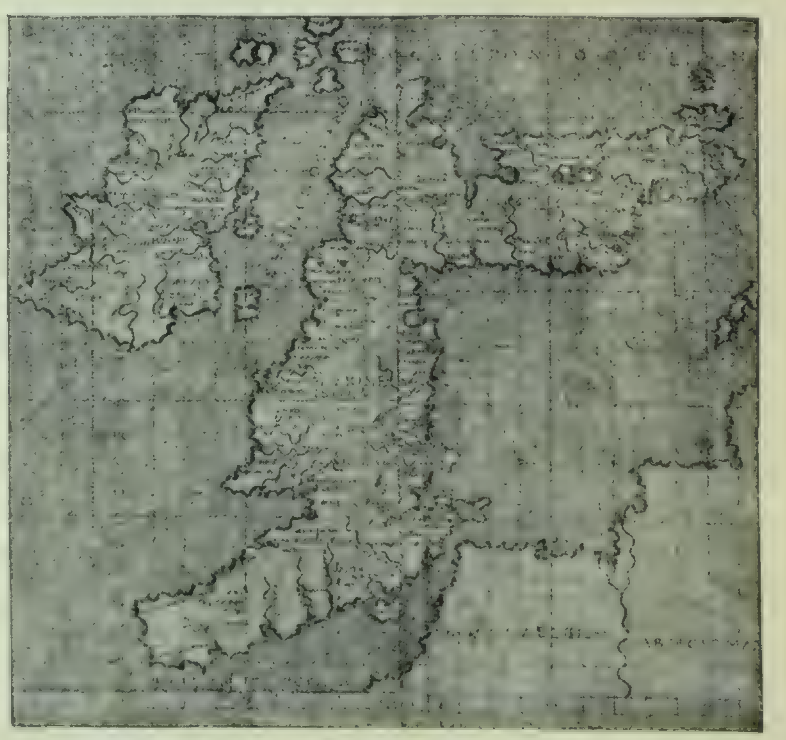
As a general rule the races of the west are more energetic than those of the east. They feel they must be up and doing, whilst the east is inclined to put off till to-morrow what should be done to-day. No doubt this spirit has helped to make the white races the rulers of the world, and their efforts have not only given them supremacy in riches and power, but have also caused them to lead the world in painting, music, and literature. The Italians have produced the greatest school of painting the world has ever seen; Germany is the homeland of the greatest musical composers, whilst our little island has produced a literature the greatest in the world since Greece.

But these things are of the past. There is danger of the white races becoming too materialistic. No selfish nation has ever prospered. Spain lost its great colonial empire because it used it only for the benefit of Spain ; France failed in Canada and India for the same reason. We should remember these things. Our nation has great power in the world, and so long as it uses it for good so long will it remain the greatest empire the world has ever seen.

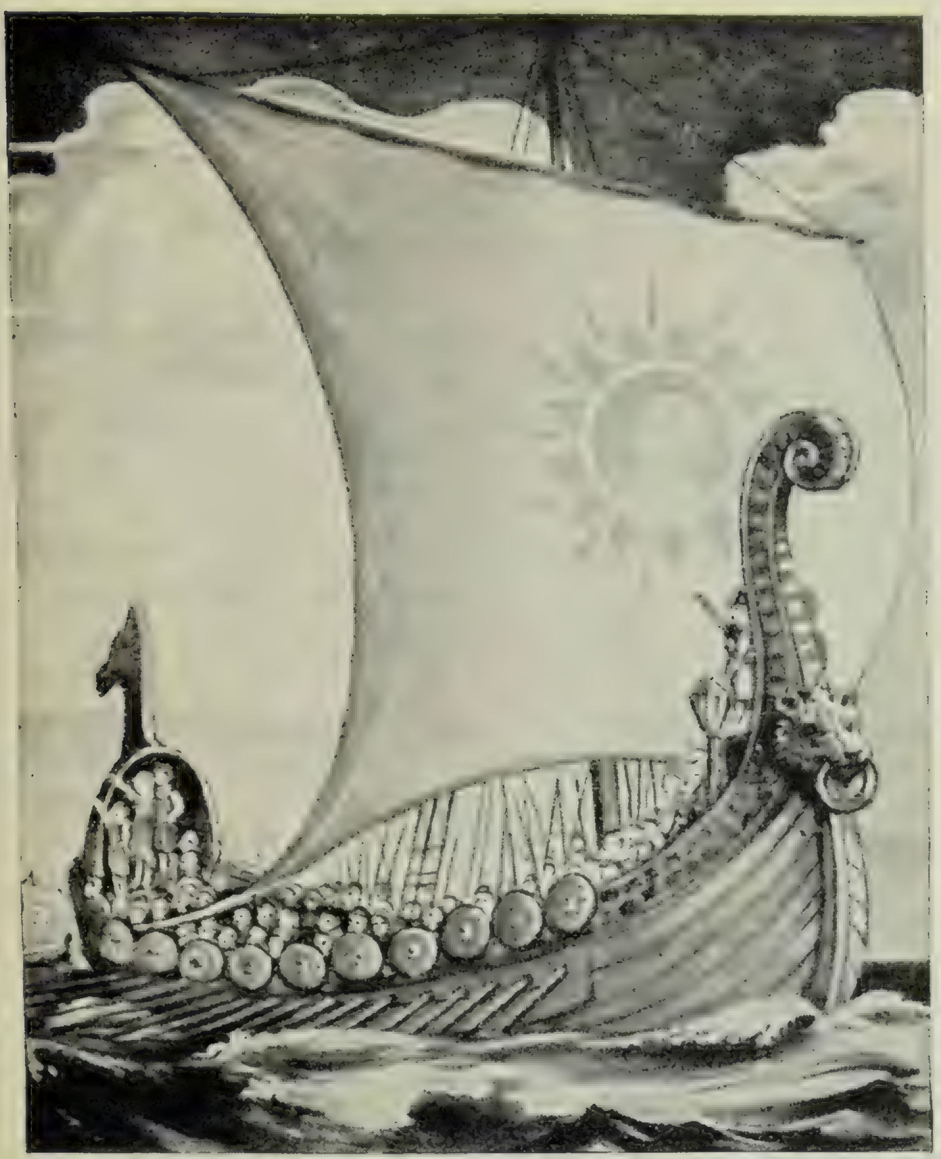
THE LITTLE WORLD OF OUR FOREFATHERS' DAYS

THE people who lived in the world long, long ago had very different ideas about it from those we know to be true to-day. Such a little world comparatively was the world they knew. There was a time, indeed, when the people who lived in Britain believed there was no other country besides their own, and when people in other countries thought the same about their own lands! But there were then no steam ships, no trains, motors or aeroplanes to carry folk swiftly from one end of the world to the other. People judged its size from what they could see for themselves, or visit in their slow-moving ships and vehicles, or even on foot, by sea or on land.

Some of the most interesting things that have been handed down to us from the past are the maps that were made in olden times, for they show us clearly how much of the world was known to the ancients, and also the quaint, mistaken ideas these peoples had of the shape and size of the various countries of which they believed it to be composed. Europe, and parts of Asia and Africa, were all that was once generally known, and these continents were only partly explored and by slow degrees, as men became bolder and more adventurous, and sailing vessels developed from floating logs to ships, partly driven by sails and partly by oars, capable of making



Ptolemy's map of the British Isles, drawn nearly 1800 years ago. We can see from this map how queer and mistaken was the old-time idea of the shape of our island.
[British Museum



This quaint old ship with the many oars is one of those used in the early days of exploration. It was in such a graceful vessel as this that Hanno set out from the city of Carthage.

anything like long voyages upon stormy seas in quest of the unknown. There were always brave men ready and willing to risk their lives in the service of exploration, and we shall now consider some of those who flung wide for us the doors of the great world.

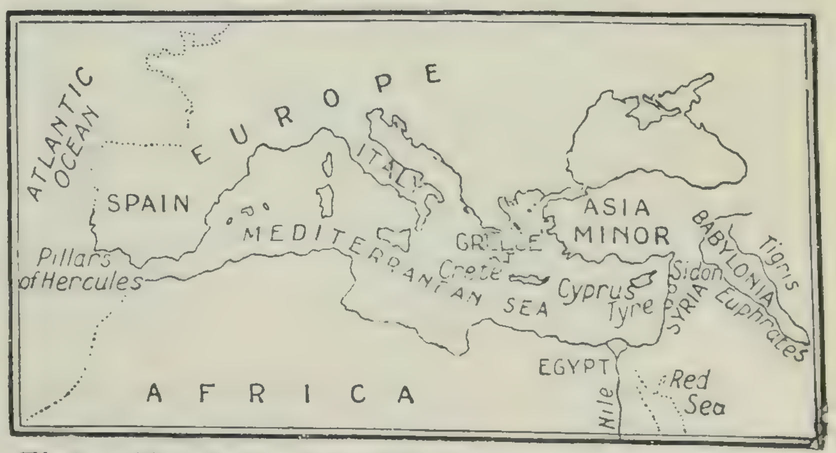
BRAVE HANNO SET OUT FROM CARTHAGE TO EXPLORE NEW LANDS.

The earliest voyages of exploration were almost all undertaken in the cause of trade, and the most famous of these were made by the Phoenicians, those wonderful seafaring people who came from the northern part of Palestine and founded colonies and trading settlements along the shores of the Mediterranean and elsewhere.

The first really notable voyage of exploration was made about 520 B.C. by Hanno, a sailor from Carthage, on the north of Africa, one of the greatest of the Phoenician colonies. With sixty large ships he set out from the Straits of Gibraltar and sailed southwards along the African coast with the intent of extending the trade of Carthage along the coast of Morocco. But the intrepid seamen went much farther than that, and a seven days' voyage beyond the Gambia they landed upon an island, from which, however, they speedily fled in terror. For at night the silence of the tropical forest was suddenly broken by the sounds of playing upon flutes and the beating of drums and gongs, while the night sky became illuminated by the blazing of fires in the bush beneath ! But still they sailed southwards, and the remainder of that voyage must have been a terrifying experience to those simple sailors. In a description of the voyage, made by Hanno himself, that has come down to us, we are told how streams of fire flowed down the sides of the hills to the sea, and finally, at a certain spot, a blaze of fire seemed actually to reach to the sky ! After three more days the mariners reached an island, believed to have been that which is known as Sherbro Island to-day. For on it there was a lake, and in the lake another island —probably the Macaulay Island of to-day. On this last island the Carthaginians found what they thought to be a number of wild and hairy men and women, but who, no doubt, were chimpanzees. Then, thinking they had done and seen enough for one voyage, they turned and sailed homewards the way they had come.

HOW THE FIRST EXPLORATIONS WERE MADE IN EARLY DAYS.

An even more wonderful Phoenician voyage of discovery is believed to have taken place. It is related by Herodotus, an early historian, who tells us that the Egyptian Pharaoh, Necho, of the XXVIth Dynasty, sent some Phoenician seamen to sail round Africa, and that starting from the Gulf of Suez they did actually circumnavigate that continent, finally returning through the Mediterranean Ocean to the Delta of the Nile ! But their voyage took them nearly three years, and every year they landed



The world as known to the Phoenicians. The dotted lines show land not known to them. Restricted as it is, this map of " the world " represents much brave and adventurous voyaging on the part of the old Phoenicians.

somewhere and sowed and harvested a crop of wheat before continuing their journey!

You will notice that all these early voyages were made along the coast. Men were as yet afraid to go out of sight of land. In these ancient times people thought the earth was flat and that if they sailed too far upon the ocean in any direction they would tumble over the edge! That great continents existed away to the west, or that there were people living on the other side of the earth beneath them, never entered their wildest dreams, just as the more savage peoples who at that time lived in the far west and south had no idea that there were other countries and peoples in the east and north.

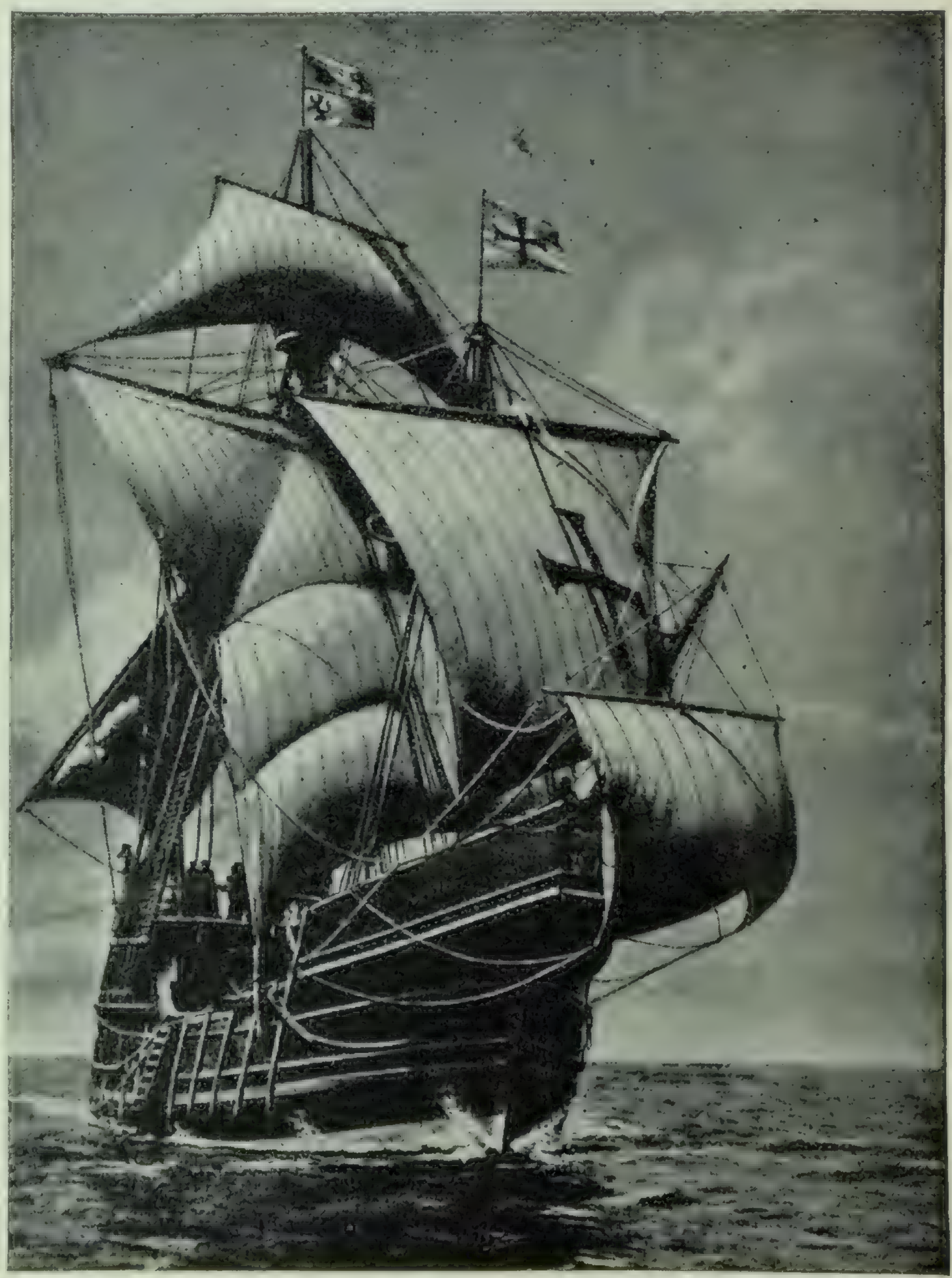
HOW DID MEN DISCOVER THAT THE WORLD IS ROUND?

As men thought about the earth's shape some began at last to think that the world was round. One thing in particular made them think this was so. They noticed that when a ship sailed away from land it did not get smaller and smaller, and then at last disappear from sight all at once as was the case with objects that moved away from them upon a flat piece of land. They watched, and they saw that first the lower part of the ship sank from view, and then the masts, and finally only the top of the highest mast was visible before there was nothing to be seen. Similarly, when a ship approached the shore the top of the masts, and then the lower parts of them, were visible before the whole of the ship came into sight. If this were so, then surely the world was round like a ball, for the same thing would happen if a ship were moving over a ball. And if the world were round and there were water all round it, then, so these wise men of old argued, it must be possible to sail right round the world, and come back to the same spot from which one started! When this belief became fixed in the minds of a few brave, adventurous men, great things began to happen. They had started with "a little world," and now they found that even if the world were comparatively very large, at least it had limitations that were within the comprehension of man, and "bounds" that were within reach of his voyaging achievements.

So navigators dared farther out to sea. The joy of sailing in unknown waters was to them far more important than the risk. There were new lands beyond the horizon, and new lands meant possible treasure.

There were also men who, for the purpose of increasing our knowledge of the world, devoted themselves to exploration. Yet others desired to win new lands for their native countries, and faced the uncharted seas as Empire builders.

Since the days of early effort, the ends of the earth have come more and more within our compass. Great liners, airships and aeroplanes make light of the distances which were so vast and so wearisome to the old adventurers.



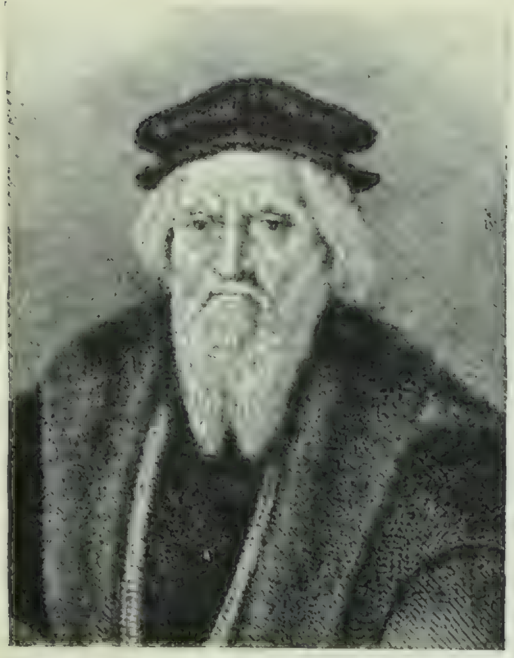
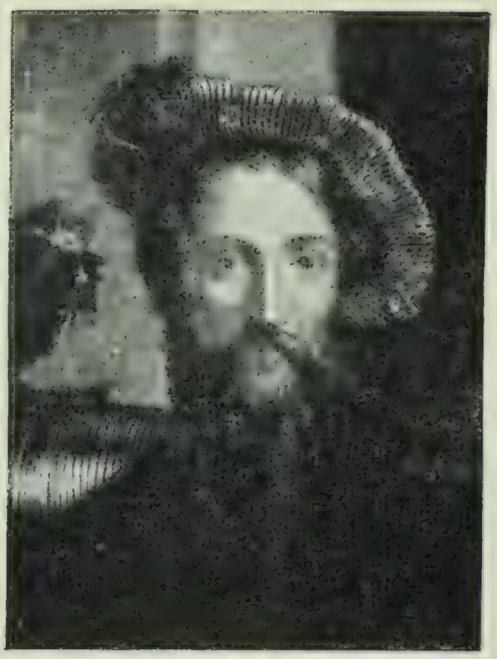
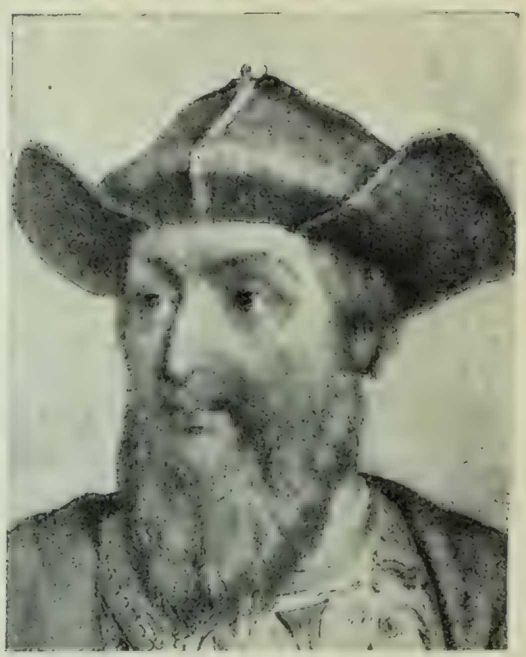
A true copy of the original *Santa Maria* (*St. Mary*), the flagship belonging to Christopher Columbus, who made such important discoveries. This ship, which was built in 1893, took thirty-six days to sail across the Atlantic.

SHELTER AND DEFENCE FOR PIONEERS

The old explorers often found, on settling in a new land, that they had to defend themselves. The natives of the newly found land were often dangerous, and later traders and explorers of other nations came to conquer the new land. These forts were built near the water at Goa in India by the Portuguese who followed Vasco da Gama. [*E.N.A.*

The explorer had to be hardy, for he had no home except the rough shelter he built for himself from the materials he could find. Here is a settler in the wilder parts of Australia. He has cut down trees, sawn out planks, and erected a hut under the trees, to house him and protect him from the weather. [*E.N.A.*

PIONEERS WHO FACED THE UNKNOWN SEAS

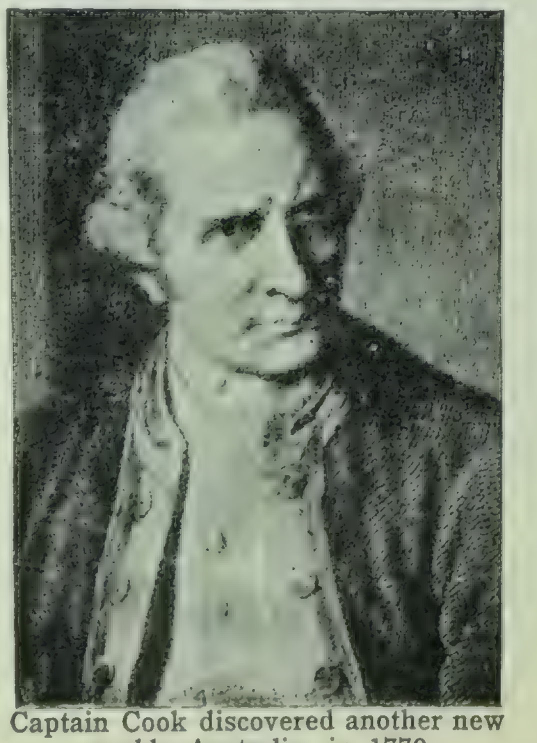




Three gallant navigators who faced the perils of the unknown and took their little sailing vessels to discover new lands across the seas. Sebastian Cabot discovered Newfoundland, our oldest possession, Columbus led the way to the West, and da Gama sailed round the Cape to India.

"WHENCE come these icebergs and these huge whales?" was most likely the question that Ohthere the Norseman, who lived "northmost of all the Norsemen," asked himself in the days when Alfred the Great was king in Britain, and which urged him to leave his home and his vast herds of reindeer and voyage northwards and eastwards in search of an answer. He found what are now known as the White Sea, the Dwina River and the North Cape, and returned with wondrous tales of all that he had seen, and some walrus teeth which he presented to King Alfred as a proof that he had really come in contact with great walruses and other strange creatures whose homes were amidst the ice-floes of the Arctic seas. He told, too, of unfriendly natives who lived near the mouth of the Dwina, and King Alfred wrote down the first description of Eskimos in a book.

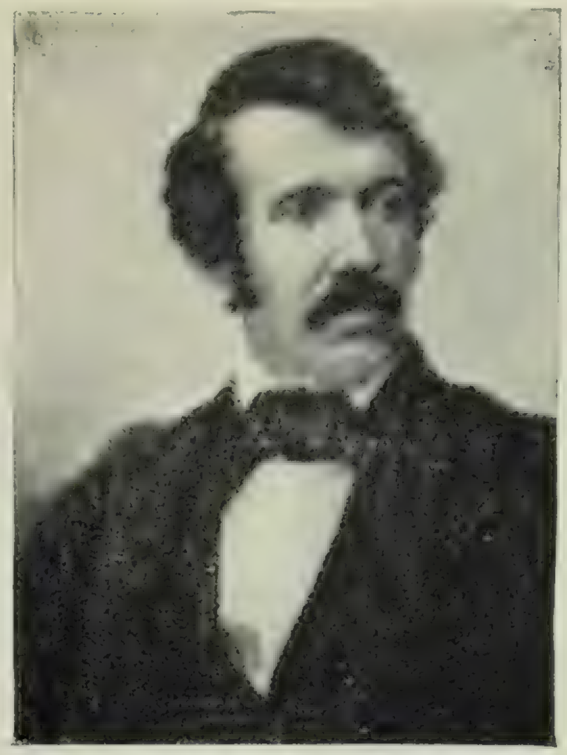
Other Northmen followed Ohthere's example and made further explorations to Greenland, Iceland and the surrounding seas, but it was not until several centuries later that the real unlocking of the northern doorways of the world began.

John and Sebastian Cabot sailed from Bristol in 1497 to try to find a north-west passage to India and the East. What they did find were Labrador, Newfoundland, and the coast of North America, all of which they claimed for England. Other intrepid seamen sought for a north-east passage to the East in the interests of trade, and sailed far north into the Arctic seas round the North Cape. The bays and capes, straits, coasts and islands of the far north remind us of the men who, in small, badly-equipped boats, braved all the perils of the Arctic regions in their eagerness to discover new lands. Here we find the names of such valiant explorers as Davis, Hudson, Baffin, Bering, Cook, and many more. In 1845 Sir John Franklin died while trying to find the North-West Passage, and as a result of the expeditions that were sent out to try to find his two lost ships, the *Erebus* and the *Terror*, and the knowledge thereby gained, M'Clure actually sailed through the Passage in 1851.



Captain Cook discovered another new world—Australia, in 1770.

Men died of cold and starvation on the way, their ships were lost and wrecked, but still others were always found ready to push ever farther and farther north. The accounts of the crossings of Greenland by Nansen, the Norwegian explorer, and his dauntless companions, make some of the most exciting reading in the world. It took them three weeks to drag their sledges over the ice to the top of the inland plateau of Greenland, which is about 9000 feet high. Later Nansen attempted to reach the North Pole, first in his famous ship, the *Fram*, and later on foot with sledges and dogs. In 1897 Andrée tried to reach the Pole in a balloon, and was never seen or heard of until 1930, when his remains and those of his comrades were found in the frozen north. It is interesting to note here that with Andrée's remains were found his note-books and his camera. The notes will add another chapter to the story of exploration.


David Livingstone, the famous missionary and African explorer.

It was an American, Captain Peary, who finally reached the goal of the Arctic explorers. He had already rounded the northern coast of Greenland, which he had proved to be an island. Then, after many attempts, he at last set up the Stars and Stripes at the North Pole, in the midst of the frozen sea, on April 6th, 1909. "The Pole at last!" he wrote in his diary. "The prize of three centuries, my goal and dream for twenty years; mine at last!"

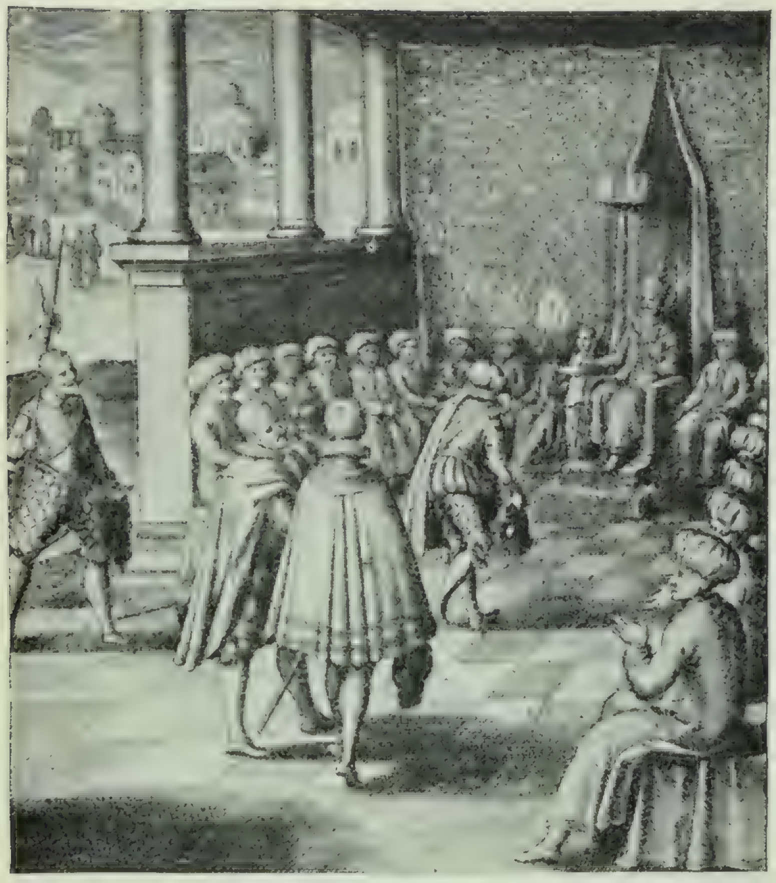
THE CALL OF THE ANTARCTIC, WHERE AMUNDSEN BEAT SCOTT.

The discovery of the South Pole was quite a different matter. Whereas in the Arctic regions land, more or less inhabited, reaches to within comparatively easy distance of the Pole, in Antarctica the Pole is separated from the southern continents by thousands of miles of open sea, and then by miles and miles of ice, for all round the South Pole is a vast continent uninhabited by man and covered with ice. It was not until 1470 that a ship crossed the equator on the way south, and no attempt to reach the South Pole was made until centuries later. But men like Drake, who in his voyage round the world proved "that the Atlantic and Pacific unite south of South America in the free and unconfined open," Captain Cook by his explorations of Australia and New Zealand, and Ross and others, all paved the way for future exploration.

Captain Scott got to within 540 miles of the South Pole in 1902, while later Lieutenant (later Sir Ernest) Shackleton came within 111 miles of it, and discovered the South Magnetic Pole. He might have succeeded in reaching his goal had not his ponies begun to eat sand and died. So the South Pole had still to be found when, in 1910, Captain Scott and Captain Roald Amundsen, a Norwegian, set out to reach it within two months of one another. It was Amundsen who won the race, and planted the Norwegian flag at the South Pole on December 16th, 1911.

Scott reached the spot on January 17th, 1912, but although he could not claim the South Pole for Britain, he and his companions have left behind them a story which, for bravery and gallantry, has never been surpassed in the annals of polar exploration. For they never reached home after this daring venture. They perished on their return journey from lack of food, and the terrible weather they en-

Peary, Shackleton and Scott, three of the heroes of the Polar regions. Peary reached the North Pole while the two British explorers fought and gave their lives in the Antarctic, Scott dying after reaching the South Pole.



This picture shows Sir Francis Drake's ambassadors being received by a native king on an island in 1579. The picture gives you an idea of how European men of quality dressed in Elizabethan times.

countered. Captain Scott relates in his diary, which is to be seen at the British Museum, how one of the party, Captain Oates, who was so frost-bitten that he knew he could only live a little longer, walked out from their tent into a fearful blizzard on his birthday to die in order to save his companions the difficulty of carrying him! Oates was, indeed, as Captain Scott wrote of him, "a gallant English gentleman." But even his sacrifice could not save his brave comrades, who themselves perished shortly afterwards on March 29th.

Since then the late Sir Ernest Shackleton and others have made expeditions to Antarctica to gain further information about that inhospitable region, and the latest explorers are flying there.

THROUGH BLAZING HEAT AND PIERCING COLD, IN SEARCH OF NEW LANDS.

It was very long ago that man first set out to discover the wonders and magic of the East. In 1269, two Venetians, Nicolo and Maffeo Polo, returned to their native city after many years' absence during which they had travelled, in the interests of trade, to Constantinople and far beyond through the great deserts of Asia to China. Two years later they set forth again for the East, this time taking with them Nicolo's son, Marco, a boy of fifteen.

What a wonderful journey that was! It took them two years to reach the court of the Great Khan of China, and they had to walk all the way! Over mountains, across deserts, through hot lands and cold they went, but they survived all the hardships and safely reached their journey's end.

INTREPID TRAVELLERS OVER UNKNOWN LANDS AND UNCHARTED OCEANS.

Kublai Khan, the great Chinese Emperor, was delighted with Marco, who grew up at court, and when he was old enough was sent by the Great Khan as his ambassador to Cochin China, India, and other lands. For Marco could now speak several languages, and was very bright and clever. Each time he returned from a journey he brought back with him not only an answer to the Khan's messages, but much information about the different countries and peoples he had seen. When after more than twenty years' absence Marco returned to Venice, he had all the new, strange things he had seen written down, and this wonderful book inspired other explorers in later times to make further discoveries in the East.

The year 1453 is one of the most important dates in the world's history, and more especially in the story of exploration. For it was the year when the Turks took Constantinople, and stopped the great trade with China, India, and Arabia, which hitherto had been carried on by way of the Red Sea, Asia Minor and the Black Sea by Western lands. It was Prince Henry of Portugal, called the Navigator, who first thought of seeking a way round Africa by sea to the rich countries in the East. The Portuguese commander, Diaz, sailed on and on down the west coast of Africa, farther than any one had been before, and finally discovered the Cape of Good Hope in 1487. Ten years later, Vasco da Gama, also sent out by the King of Portugal, sailed right round the Cape and in spite of terrible storms and mutiny among his men kept bravely on along the east coast of Africa. Here, at one of the great cities he found, he got a pilot who showed him the way across the Indian Ocean to India, which he finally reached. The interior of Africa was not explored until three hundred years later, when James Bruce found Aybssinia. He was followed by Mungo Park and David Livingstone, who further opened up the Dark Continent.

IT was Christopher Columbus, a Genoese, who first sailed Westward Ho! He believed that the world was round, and that if he sailed away to the west he would finally reach India across the Atlantic Ocean. The adventures of Marco Polo also inspired him with a great desire to know more of the wonderful countries his fellow countryman had visited. But alas! his native city would not help him when he asked for money and ships to carry out his bold enterprise. So Columbus went to Portugal, and even wrote to England for aid, but help was not forthcoming from either of these countries. Finally he obtained from Spain three ships, only one of which, the *Santa Maria*, had a deck, and on August 3rd, 1492, he set sail with a crew of eighty-eight men upon one of the boldest voyages of discovery ever made. For two months and nine days Columbus sailed on and on across the unknown Atlantic ocean. The men were frightened, and often wished to turn back—they were afraid lest they might have to sail on and on for ever! You can imagine their joy when, at ten o'clock on the night of October 11th, Columbus saw a light ahead shining in the darkness. Next morning, dressed in his finest clothes and bearing the royal banner of Spain, he landed upon a beautiful island which he claimed for the King of Spain.

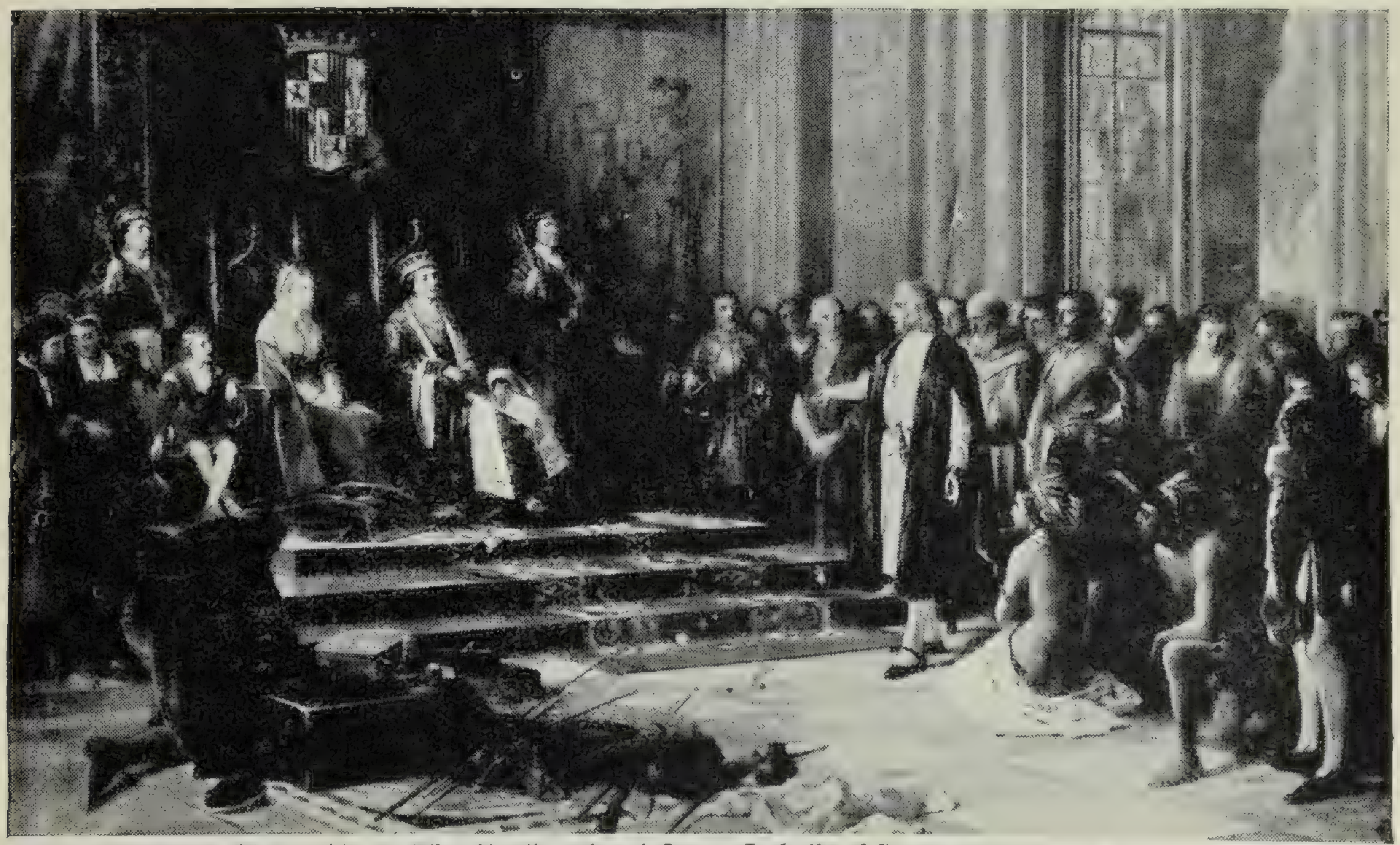
COLUMBUS, AFTER AN ADVENTUROUS JOURNEY, DISCOVERS THE RED MEN OF AMERICA.

Other islands were soon discovered, and Columbus thought they were the western islands of India. So he named them the West Indies, and their inhabitants he called Indians, and all the native red men of America have been called Red Indians ever since.

THE MAN WHO, AFTER MANY PERILS, DISCOVERED THE NEW WORLD.

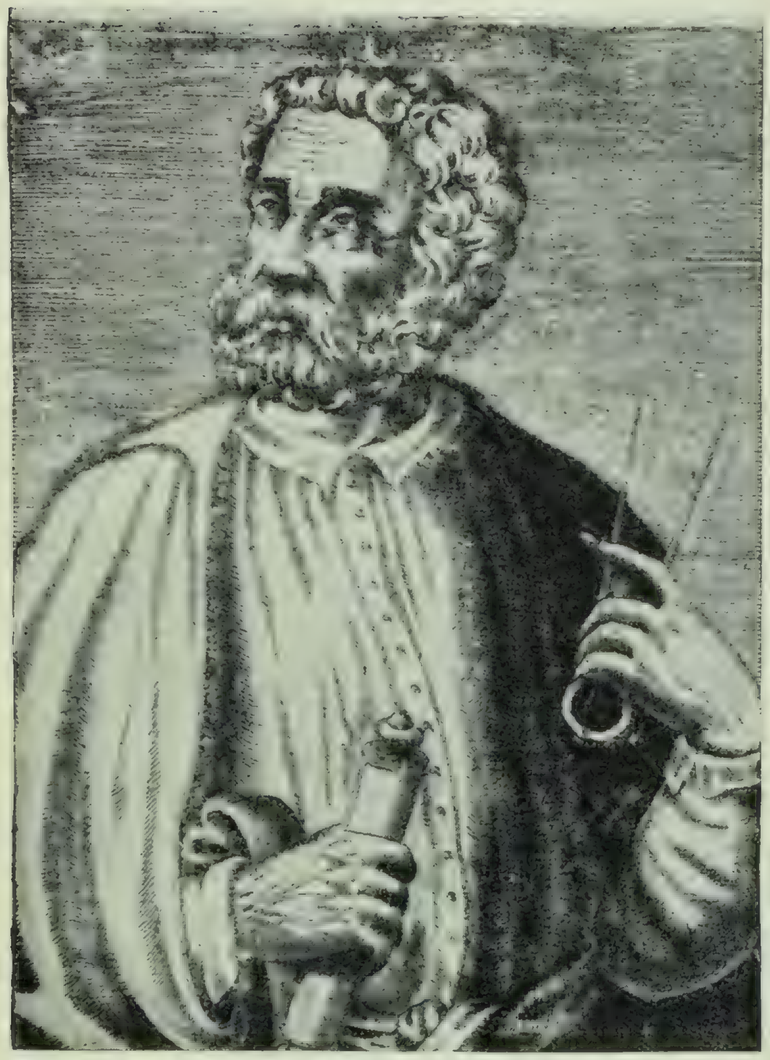
Later, in the year 1493, Columbus sailed proudly home to Spain with the news of his discoveries, and the same year he sailed back to the West Indies, this time with seventeen ships and fifteen thousand men. He found yet more islands, and on a third expedition still more. But he never knew he had really found a new continent and had not sailed round the world to Asia. It was Amerigo Vespucci who, after Columbus was dead, made further explorations and found these new islands were not part of India. "It is a New World!" said Vespucci, and for a long time the new land was known by this name. But in 1506 its name was changed to America, a word modelled on Vespucci's Christian name.

Ferdinand Magellan set out in 1519 to try to reach India by sailing to the west. Down the coast of South America he went, and at last found a place where the coast seemed to divide in two. So through this channel he sailed, encountering a terrible storm on the way, and after thirty-eight days he came out into a calm, smooth ocean on the other side. Magellan named it the Pacific (peaceful) Ocean,



Columbus showing his trophies to King Ferdinand and Queen Isabella of Spain on his return from his perilous voyage to the New World. He had brought back with him some of the natives, whom he in error named "Indians." Columbus never knew that he had found a new continent, the Americas, and had not sailed round the world to India.

[*From the Painting by R. Balaca*



Magellan commanded the first expedition to sail round the world. Though he himself was killed on the way, one of his ships, under Sebastian del Como, completed the momentous voyage.

and the straits through which he reached it he named the Magellan Straits.

Then he went on with his five ships halfway round the world to the Philippine Islands. Here Magellan was killed in a fight with some natives, and his second-in-command, Sebastian Del Cano, then continued the voyage with the only ship now fit to sail on. At last he came to the Cape of Good Hope, and sailed homewards round it, thus being the first man to sail right round the world.

FRANCIS DRAKE, BUCCANEER AND GALLANT SEAMAN, SAILS ROUND THE GLOBE.

Fifty years later Sir Francis Drake sailed round the world, starting from England. This was a wonderful voyage. Five ships set sail from Plymouth Harbour, manned by stout English seamen and led by Drake's own ship, the *Golden Hind.* All went well until they neared the Straits of Magellan. Then strife broke out among the crews, and only the firmness and promptitude of Drake in executing the ringleader, his friend Thomas Doughty, prevented a mutiny. When later he offered a homeward passage to any who wished to return, not one of his crew would turn his back on Drake and adventure.

In the straits they encountered a terrific storm, which lasted for more than seven weeks. Two of Drake's ships he had previously burnt, as he did not need them. Of the remaining three one went down in the storm, one turned back, and the third, the *Golden Hind,* was borne southwards to the open sea.

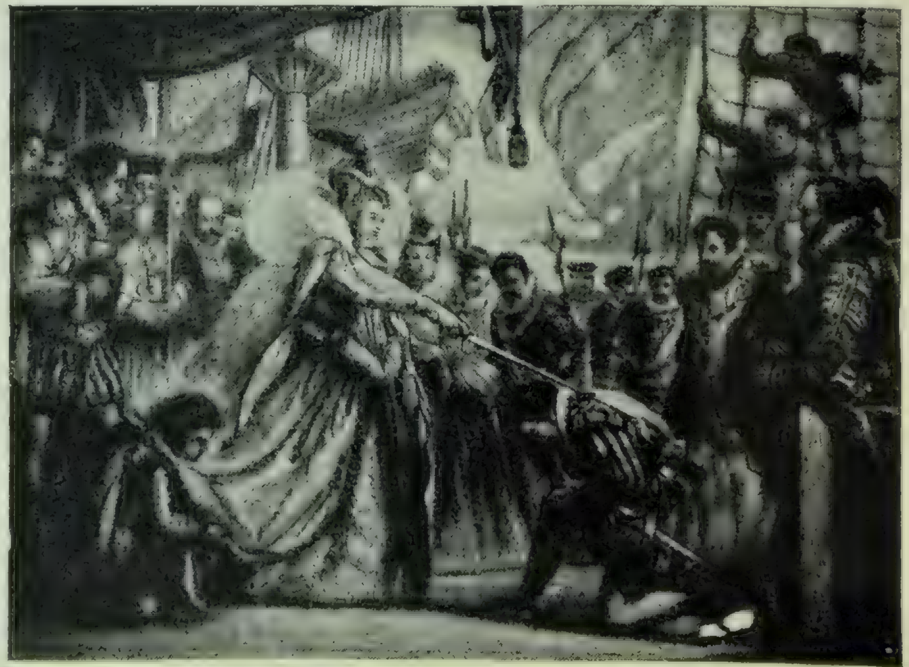
HOME AT LAST, AND THE WORLD CIRCUMNAVIGATED BY THE "GOLDEN HIND."

When the storm abated they sailed north again along the west coast of America, taking a Spanish ship laden with treasure off Valparaiso. Defeated in their purpose of sailing round America and so homewards, the adventurers turned south, then westwards once more. They had many mishaps. Once their ship ran on a reef, and once they landed on an island where the natives stole nearly all their goods.

At last they rounded the Cape of Good Hope (" the fairest cape we saw in the whole circumference of the earth "), and three months later, after an absence of three years, arrived in Plymouth Harbour.

In the spring of the next year Queen Elizabeth came on board the *Golden Hind* in state ; and there before a great and gallant company she knighted Francis Drake, " the Pirate Captain," as the Spaniards called him.

History is rich in stories of exploration by land and sea, and each thrilling tale tells how one by one the doors of our world were unlocked at last.



When Drake returned from his adventurous voyage round the world, Queen Elizabeth came on board. Though Drake had really been as much a buccaneer as a navigator, she knighted him for his services.

LANDS THAT UNITE TO SPAN THE EARTH

The busy city of Winnipeg—one of the largest wheat centres in the world. The wheat, gathered in from the vast Prairie region, is distributed from Winnipeg to all parts of the globe. The tall skyscrapers tower above the streets. The city is well planned, for Canadian cities are of fairly recent foundation, and there is land sufficient for proper town-planning.

UPON the great British Empire the sun never sets. Scattered over the globe are the many lands, great and small, that go to make the Commonwealth of Nations.

A few days' journey across the Atlantic Ocean westwards brings us to the Dominion of Canada, that vast area of land in North America that is almost as large as Europe. If it is summer, our ship will take us far up the long, deep estuary of the St. Lawrence River, but from December to April, when this is blocked with ice, we must land outside.

CANADA, THE LAND OF THE WAVING GOLDEN GRAIN.

On the river we pass Quebec, called the Gibraltar of the New World, for it stands upon a lofty crag overlooking the river. It was formerly an Indian camp from which the natives set out on their hunting and fishing expeditions. The old town is not well built ; the houses, some of timber, are cramped in narrow streets, but the upper town is a handsome city with wide streets, large buildings, parks and miles of open country around. In the great province of Quebec the majority of the people are of French descent, speak French, and keep up many old French customs in the picturesque little villages where many of them live, chiefly engaged in farming, fruit-growing and cutting down trees in their great forests.

In the north of the province the lakes, rivers and waterfalls are very beautiful, and the torrents which rush through the narrow gorges are made more picturesque by the winter frost. The climate of Quebec in winter is more severe than that of the Atlantic provinces, but in summer the relative temperature is much higher.

Nearly one thousand miles from the river's mouth we reach Montreal, the largest city and chief port of the Dominion. Montreal is an exceedingly attractive city, built of limestone and white and clean in appearance. In summer when the sun is shining the gardens are a blaze of colour, orchards are stocked with fruit and farms are full of life, while yachts and canoes flit about on the river. In the winter all is changed. The trees are covered with snow or rime, the river is frozen, and skating, sleighing and tobogganing take the place of yachting and motoring. Originally Montreal also—like Quebec—was an Indian settlement, built on an island opposite the mouth of the Ottawa River. It is now a great port and railway centre. Here we shall find ships being loaded up with Canada's goods to take all over the world, and here we must leave our ship and get into a train on the famous Canadian Pacific Railway, if we wish to continue our journey farther west.

VISIT ITS LARGEST CITY AND PORT, MONTREAL, QUEEN OF THE DOMINION.

More and more wonderful is our journey ! One of the most wonderful railway journeys in all the world. We shall pass through Ottawa, the capital of the Dominions, with its beautiful Houses of Parliament and Government

Buildings, and its fine and stately streets. Originally Ottawa was a great timber depôt on the Ottawa River, and it still possesses the finest sawmills in the state, while nearly all the villages are engaged in some branch of the forest industry. If we look to the south as we journey westwards we shall notice forests of tall trees and perhaps see many men cutting them down. In the river near the lumber camp, or tree-cutting works, we shall see thousands of logs floating down together on the water, while men on rafts made of logs steer other logs down the river. This is the best way of transporting the heavy trees to the sawmills which await them. Afterwards the wood is ground into pulp and from this pulp paper is made. Many of the newspapers you see lying about at home once formed parts of great Canadian trees.

THE ROARING NIAGARA FALLS—POWER-HOUSE OF THE BORDERLANDS.

We shall get out farther on, of course, to visit the Niagara Falls. "Thunder of the Waters" is the meaning of the Indian name, Niagara, for the roaring of these tremendous and magnificent falls can be heard for miles around in the summer. But in severe winters the waters are frozen, and then a wonderful silence takes the place of sound. Then come those five great lakes—Ontario, Erie, Huron, Michigan and Superior, which between them hold more than half the fresh water on the surface of the earth! Lake Superior is so big that we could drop England into it and lose it! The northern half of the lakes is in Canada, but if you sail more than half-way across you are in the United States.

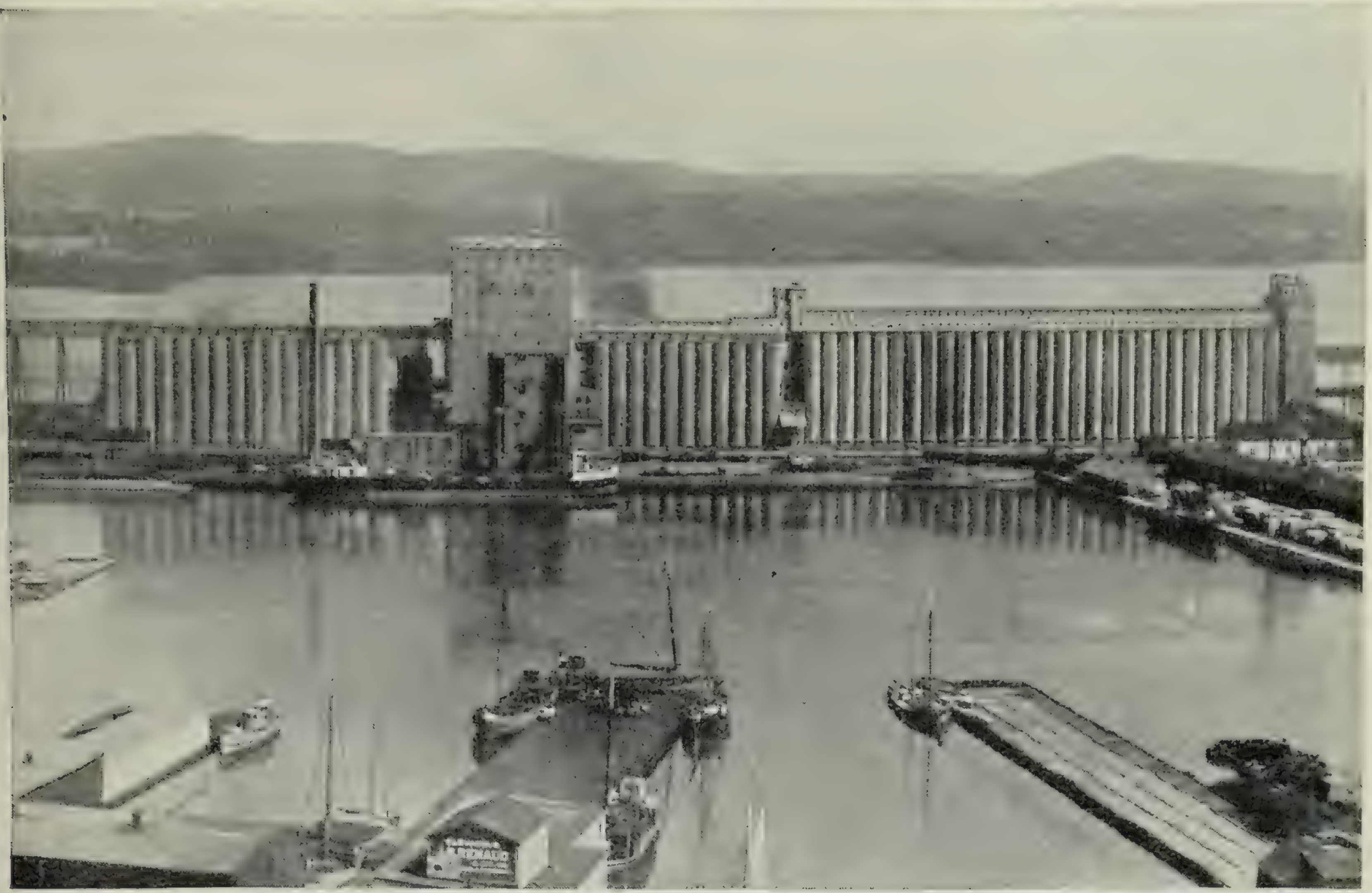
THE SPACIOUS LAND WHERE THE COWBOY REIGNS AS KING.

Beyond the lakes come the prairies, where the first settlers had so often to contend against the redskins, but where now all is peace, and, as well as wild open grassland, thousands of miles of corn. We do not see cornfields like those of our own land. There are no fences every few hundred yards. Instead there is corn as far as we can see, on all sides. People of all nations live to-day upon the prairies, and their wheat is distributed from Winnipeg, the chief prairie town, and one of the largest wheat centres in the world.

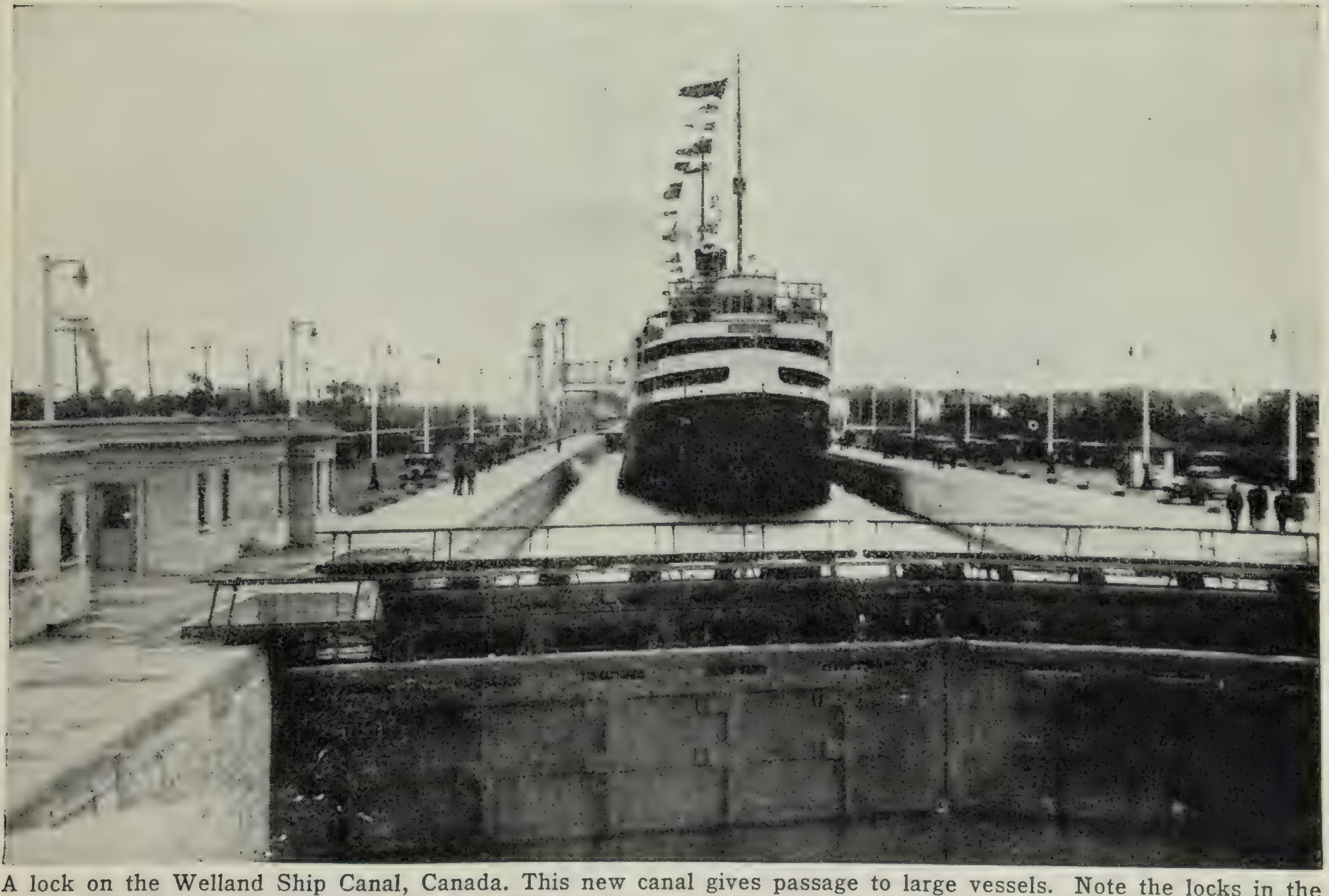
Still we travel westward, and we come to the mighty and glorious Rocky Mountains, at the foot of which live the cowboys looking after cattle on many a great cattle ranch. Cattle-rearing is a hard task, and the men engaged on it must be strong and fearless, for the cattle are sometimes very fierce. The cowboys, as you know, are fine horsemen, and they know how to round up the cattle and catch those needed on the ranch. In one of the great natural valleys or "parks" amongst the Rockies, at Banff, through which our train will pass on its great upward climb, we shall see numbers of bison and other wild creatures

A beautiful scene in the majestic Rockies—Emerald Lake in British Columbia. This pine-shrouded lake, with the towering peaks in the background, is one of the many found among the picturesque mountains and in the great natural valleys which separate the peaks. The still waters reflect the snow-clad peaks and the forests of giant pines.

MODERN CANADIAN ENGINEERING MIRACLES



This giant elevator in Quebec Harbour stores 4,000,000 bushels of grain, keeping it in perfect condition to load on ships. The grain is run down from the elevators straight to the holds, and when the ships are cleared the wheat is drawn from the hold by suction pipes. These act in the same way as the tube of a vacuum cleaner.



A lock on the Welland Ship Canal, Canada. This new canal gives passage to large vessels. Note the locks in the foreground and the bridge behind the ship. The bridges are made either to raise or to swing, to allow the passage of the ships. Note the set of the lock gates. They point towards the high water when closed. [*Canadian Emigration Bureau.*

roaming in freedom and safety, for in this Grand National Park no animal may be killed.

Upward, ever upward we go, until we come to Kicking Horse Pass, with the snowclad mountains all around; then through the Great Divide, and down into British Columbia, where in the warm climate some of the finest fruit in the world is grown. Great rivers rush down from the Rocky and neighbouring mountains and flow through cañons or narrow gorges with great cliffs on either side. The coast is broken up by many deep and wide valleys. Into these salt water fiords the rivers flow. At certain times large fine fish swim up the fiords and into the rivers. These are salmon, and they are so plentiful that great numbers can be caught in nets let down into the rivers. You will also see large factories where the salmon are cooked and put into tins. Most of the tinned salmon we see comes from this western part of Canada.

THE FRENCH HELPED TO MAKE THE BRITISH DOMINION OF CANADA.

At Vancouver, on the Pacific coast, our wonderful railway journey comes to an end. If we would see more of Canada we can visit some of the great forests in British Columbia and watch the lumbermen at work, or travel northwards to bleak and desolate Yukon, where gold is found. You will have seen that the people of Canada are nearly all white folks. Those in the east are mostly French-Canadians, whose great-great-grandfathers came from France to settle in Canada long ago. Of the rest of the white people a great number are British, and many have gone from this country to farm the fertile but desolate prairie. In the Arctic prairies and the "Great Lone Lands" on the borders of the Arctic Ocean, only traders, Indians and Eskimos can live.

A French-Canadian seeking adventure in the wilds. He is seen setting out on an expedition to shoot and trap animals. Note his snow-shoes resting by the trees.

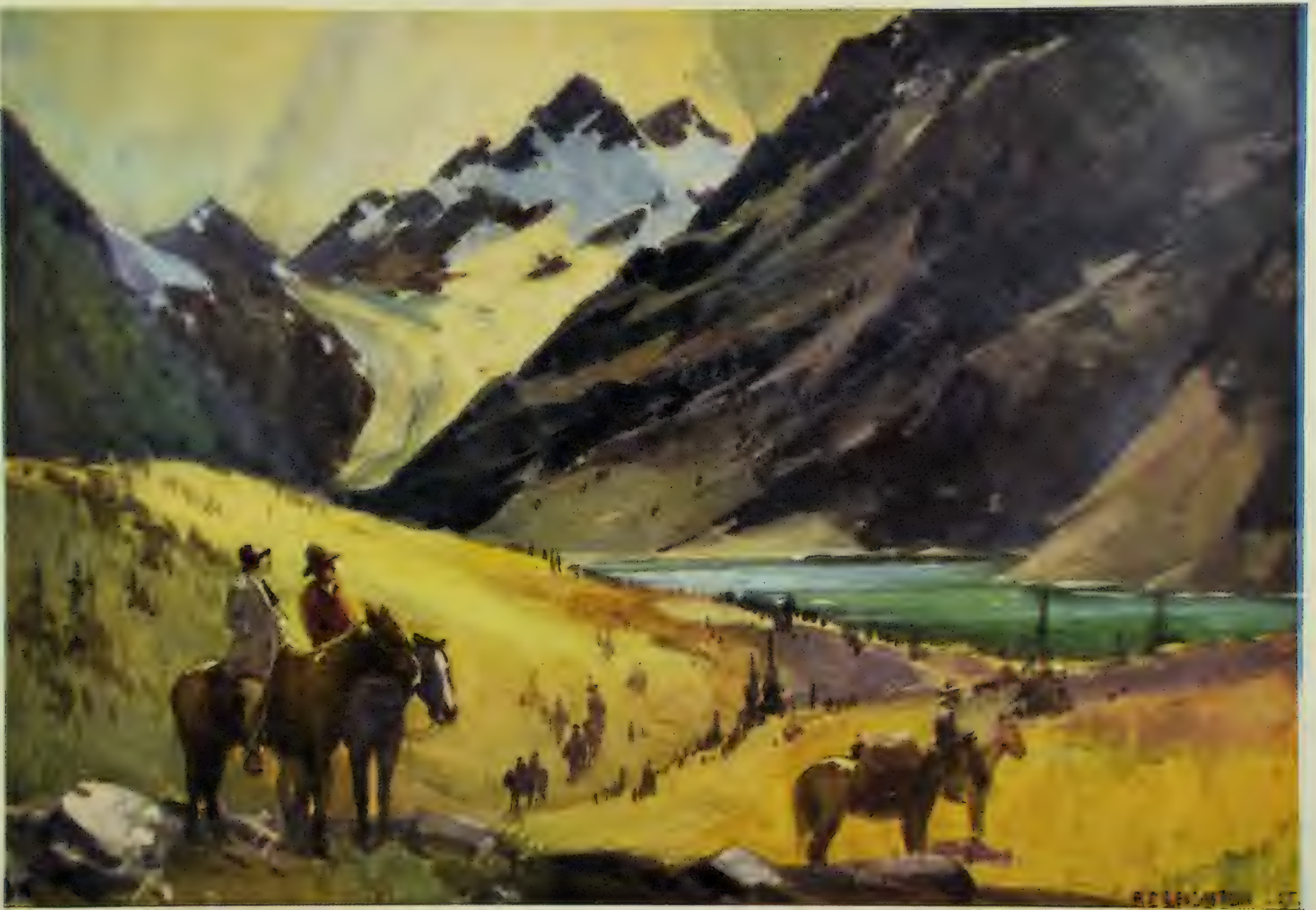
This region, as well as the wheat-bearing parts of the country, has gained for Western Australia the name of "The Golden West." Above we see a Kalgoorlie gold-mine.

Off the east coast of Canada is a very large island called Newfoundland, and in the seas around millions and millions of codfish are caught every year. Newfoundland is not a part of Canada. It is a land to itself, but it, too, belongs to our great British Empire.

THE "LAND OF THE GOLDEN FLEECE" WHERE MILLIONS OF SHEEP ARE REARED.

From Vancouver another ship would take us to Australia, often called the "Land of the Golden Fleece" on account of the millions of sheep that are reared. Indeed, most of the world's wool comes from Australia. One of the sheep-farmer's great enemies is drought, for in some parts of the country no rain falls upon the plains for months on end. So Artesian Bores are sunk. These are deep wells going far down beneath the ground, formed by boring with a kind of large gimlet, followed by a pipe through which the water rushes up from below with tremendous force.

Besides sheep, thousands and thousands of cattle roam about as though they were wild. Some of them are really wild, and the cattlemen have hard work, sometimes, to round up their beasts. Where there is such a large number of cows there is much milk, and this is



RIDERS OF THE ROCKY TRAIL.

In the rugged Rocky Mountains, where high peaks and deep ravines make travel very difficult, daring trail breakers penetrate on horseback through dangerous passes. The scene above shows the beauty and grandeur of these majestic mountains, with their nestling, mirror-like lakes.

(Reproduced, by courtesy, of the Canadian Pacific Railway, from the painting by A. C. Leighton.

The fine city of Perth, which has grown so rapidly, is situated near the gold-fields, and is one of the six largest cities in Australia. Harvests of golden wheat pour into this town ready for export. Gold, also, is sent from here.

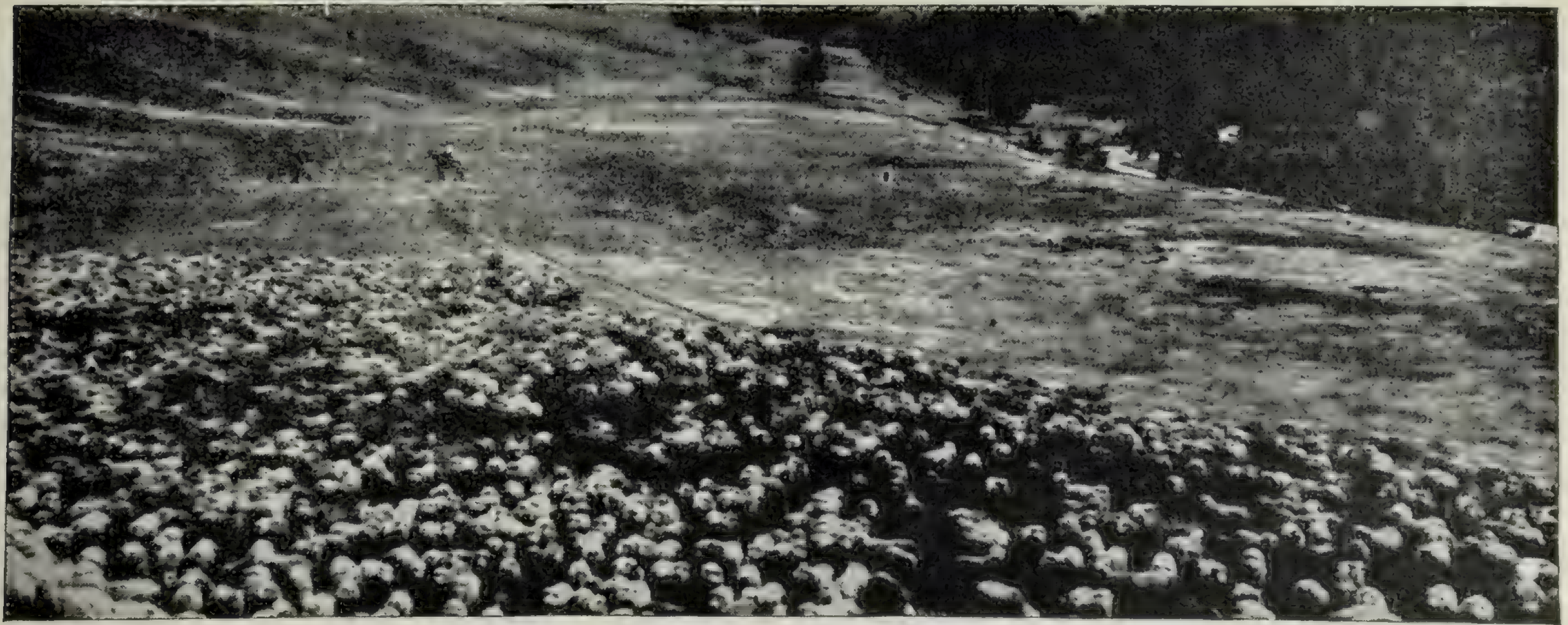
made into butter. You may buy Australian butter in the shops of our own country nowadays; also Australian beef, mutton and dead rabbits. These are brought over in ships with special rooms where food can be frozen and kept cold all the way across the sea. Food that is frozen does not go bad, so that these things reach us in perfectly good condition.

THE state of Western Australia is also known as the "Golden West," partly from its rich harvests of golden wheat and partly from its large output of gold. More than one-third of Western Australia is desert, and the gold is found in the quartz beneath, and then taken by train from Kalgoorlie and other gold-mining towns to the great city and port of Perth, four hundred miles away. In Western Australia, too, are many great forests of jarrah trees. Jarrah is a very hard wood, and is largely used for paving streets and for railway sleepers. Many of the streets of London are paved with wood that was once growing in an Australian forest, and many of the sleepers on the Indian railways are of the same origin, because the white ants that destroy so much wood in hot climates cannot destroy jarrah.

There are a great many fine towns in Australia. The harbour of Sydney in New South Wales is one of the finest and largest in the world. South of Sydney another new large city is growing up. When it is finished this Garden City of Canberra will be one of the finest cities in the world. It will give you some idea of the vast size of Australia when you hear that the "mother colony" of New South Wales alone is more than six times as large as England!

Nearly half the people of Australia live in the six biggest cities. These are (besides Sydney) Melbourne, Brisbane, Adelaide, Perth and Hobart. Melbourne was the chief city until Canberra was built, and is so busy that it reminds you of London, but, unlike London, it has no slums. Instead there are fine cottages, each with its own bit of garden.

Brisbane is a busy port where bananas grow in the open air, and palm trees wave in the breeze. Adelaide, in the heart of the fruit-



Australia is the wool centre of the world, and because of its millions of sheep is often called "The Land of the Golden Fleece." Australian shepherds have a busy time rounding up their large flocks on horseback.

growing district, is a city like a sweet-scented garden. Perth, away in the south-west, has grown up quickly. It is not far from the places where gold is found and is a fine city with parks and wide streets.

The island of Tasmania, nearly two hundred miles from the mainland, is very beautiful. It has been called the "Garden of Australia." It is nearly as large as Scotland, and has many fine harbours; also magnificent orchards and fruit farms where apples and pears, raspberries, strawberries, mulberries and cherries are grown. Hobart, its chief town, has a lovely harbour, and lies at the foot of a high mountain.

THE HOME OF OUR CANTERBURY LAMB, OF HOT SPRINGS AND WONDERFUL SCENERY.

South-East of Australia is New Zealand, divided into two islands, North and South. In North Island there is a very wonderful part known as the Thermal or Hot Springs District. From this flat country, where almost the only vegetation is the manuka or "tea tree" scrub with greyish green leaves, numbers of geysers or columns of hot water are everywhere spouting up from the ground. Long ago, some of the hills and mountains which break the flatness of this district were active volcanoes. But to-day the heat and energy, which once came up from the earth as flames and lava, take the form of vapour and hot water. A large geyser in action is a most beautiful sight. The tall column of rising and falling crystal-clear water is surrounded by a thin veil of spray and steam, and when the sunshine catches it, it sometimes seems to be composed of thousands of diamonds, at others all the colours of the rainbow are reflected in it.

The original natives of New Zealand, the Maoris, are an exceptionally intelligent and picturesque race, who still retain many of their old customs and traditions. Above we see an old Maori woman. Maoris rub noses instead of shaking hands on meeting.

The hot pools contain sulphur, and people come from far and near to bathe in some of them. Others are used by the Maoris for washing their clothes and cooking their food. For numbers of these early native inhabitants of New Zealand still live in this region, and keep up their old habits and customs. Their skin is of an olive colour or even lighter, and they have black or very dark brown hair, large noses and bright eyes. They love dancing and telling or singing their old songs and legends in their beautiful picturesque language. Ao Tea Roa, the "Long White Cloud," is the name the first Maoris gave New Zealand, when from their boats they saw it stretching before them just like a cloud.

From Wellington, the capital of New Zealand, with its fine harbour where all the fleets of the world could find anchorage at once, we cross over by Cook Strait to South Island. Here are the Southern Alps, a marvellous chain of mountains with scenery as grand as, and even grander than, that amongst the Swiss Alps. Mount Cook, the highest mountain, named after the great explorer, is called by the Maoris, Aorangi, the "Bright Light in the Sky." Mountains by them are held in deep veneration.

On the east side of South Island, at the foot of the Southern Alps, are the beautiful grasslands of Canterbury. Here sheep and cattle are reared in large numbers, and form an important source of wealth. The value of the wool export is very great. Butter and cheese are sent abroad to many lands and frozen meat also is exported, "Canterbury lamb" being sent to England in special vessels which contain freezing appliances. Other exports include gum, varnish, timber, hides, leather and fruits. Wine-making too is becoming important.

"THE ISLANDS OF SUNSHINE," WHERE FLOWERS AND FRUIT GROW IN GAY PROFUSION.

The West Indian Islands, so named by Columbus because he thought in them he had discovered India, are really situated off the coast of Central America and are often called "The Islands of Sunshine." There is hardly a day throughout the year when the sun does not shine on them. Jamaica, the largest island, and the others are covered with beautiful tropical vegetation—tropical fruits and flowers grow everywhere. Trinidad was named by its earliest inhabitants, the Caribs,

Indians planting rice. The plants are sprouted in seed beds before being planted out by hand in flooded ground.

Iëre, the "Land of the Humming-bird," on account of the numbers of these beautiful little birds that live on this island. British Honduras, on the mainland of America, is famous for its trees, mahogany, logwood, cedar and others, which are felled by the natives, sent floating down the rivers to the port of Belize, and thence shipped to England.

INDIA, THE LAND OF MANY TONGUES AND RELIGIOUS BELIEFS.

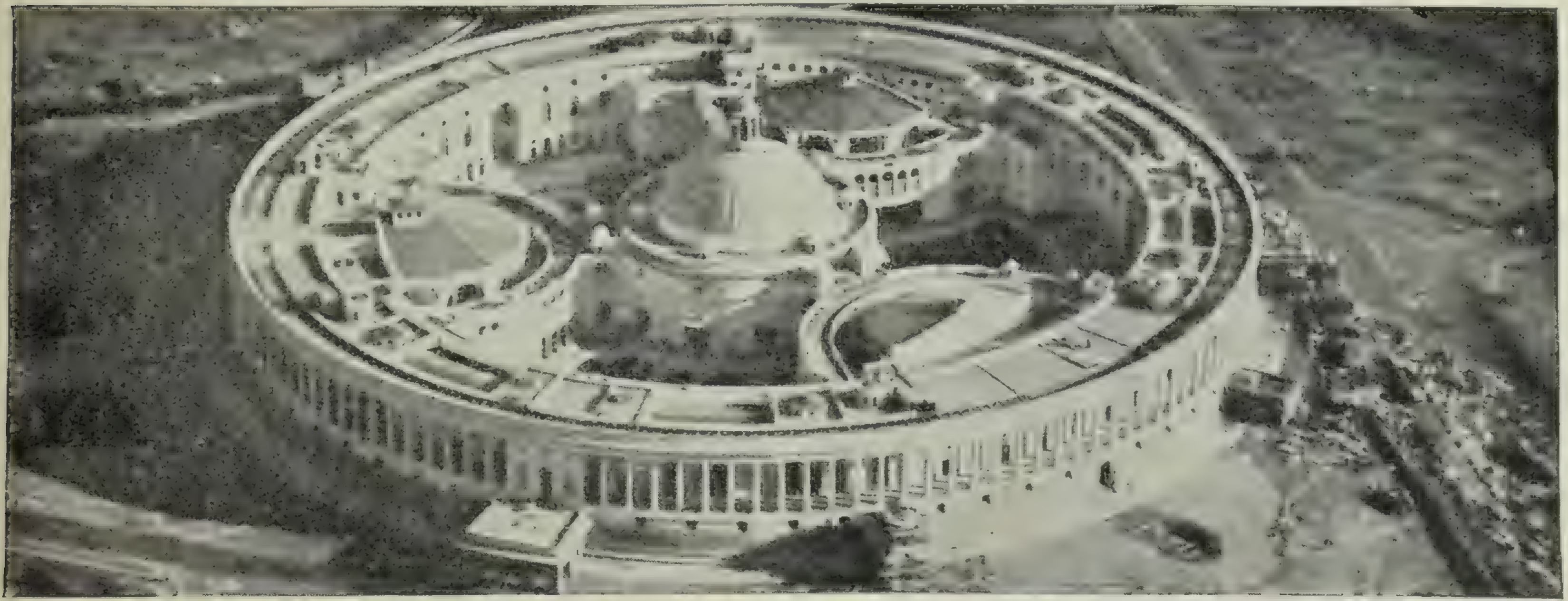
India has been spoken of as "The Land of the Many," so varied and numerous are the people who throng the crowded streets and bazaars of its great cities. There is no better city in which to see them than Benares, where pilgrims flock from all over the country to bathe in the waters of "Holy Mother Ganges," and at sunrise especially the *ghats*, or stone steps leading down to the water, are always packed with men and women dressed in all colours of the rainbow.

On the high ground between the river-basins of the Ganges and the Indus stands Delhi, the capital of British India and the seat of government; though in the hot weather the government is transferred to Simla, among the hills, where it is much cooler and pleasanter for white people. A part of Delhi is modern, but the Grand Mosque and other ancient buildings remain to tell of its former magnificence, in the days when it was the capital of the old Mogul Empire.

To-day it is a wonderful shopping centre, its bazaars stocked with goods gathered not only from India but from other parts of Asia and from Europe and Africa as well. India itself produces some of the world's most exquisite handiwork—beautiful carpets, fine carvings in ivory and wood, gold, silver and brass-work, rich silken embroideries—and these are the things one finds in the Delhi bazaars.

IT is not so very many years since Delhi became the capital. The old capital was Calcutta, but its position on the Ganges Delta was a drawback. It is too near the unhealthy district of the Sunderbunds, where tigers and elephants, snakes and crocodiles make their home, and myriads of insects infest the swampy jungle. In spite of its position, however, Calcutta is a fine city still, and here we may see the big steamers bringing goods to India and carrying tea and other merchandise to Britain and every part of the world.

In those regions the jungle elephant is



The magnificent building here seen from the air is the seat of government in New Delhi, and has recently been built.

caught and tamed, and taught to do heavy work such as lifting and piling up the valuable timber in which India abounds. An elephant can lift a heavy log quite easily with its trunk. Farther north among the mountains the yak, a kind of bullock, is a favourite beast of burden.

Lucknow, famous in connection with the Indian Mutiny, is another city where beautiful old carvings may be found. In Agra is the most perfect building in the world, the Taj Mahal, built of white marble with a central dome gilded with pure gold. It is not a temple, as it is sometimes called, but a tomb.

In Southern India is Bombay, white and beautiful against its background of palm-clothed hills. Built on an island, connected by railway with the plains behind the mountains, it is the most important city in the west. Here the colours and races are peculiarly mixed. Though much of Bombay is European and modern it has some beautiful specimens of native architecture, while near by, in the grottoes of Elephanta island, are some wonderful carvings cut in the solid rock.

THE Deccan, the great plateau in Southern India, is the home of vast numbers of the people living in villages in huts made of bricks and mud and thatched with palm leaves. Here they carry on their different trades. You will find potters, carpenters, weavers, blacksmiths, goldsmiths and others, while numbers work in the fields, ploughing, sowing, reaping and drawing water from the wells. They use bullocks to draw the ploughs, as the people in the cities use them to draw their vehicles.

In the far north of India we shall find the wonderful Himalaya Mountains, some of the peaks of which are always covered with snow. Splendid views of them are obtained from Darjeeling, the hill station to which the white people flock to escape from the intense heat of summer in the plains below. From here can be seen the great Kanchanjunga, and farther away the highest mountain in the world, Mount Everest, or as the Tibetans call it, Chomolungma, "Goddess Mother of the World."

THE mighty range of the Himalayas forms an almost impenetrable barrier across the north of India. It can only be crossed in a few places, one of which is the famous Khyber Pass leading from India into Afghanistan. Many a great army has marched that way to conquer India in the past. To-day it is a great highway, thronged three days each week from sunrise to sunset by endless caravans of mules, camels and buffaloes bearing merchandise to and fro between Peshawar and Kabul. Tribes of wild Afridis inhabit the hilly country on either side of the Pass, and it is to protect India from these and other enemies that we still have to guard this north-west gateway into Hindustan with ceaseless vigilance.

India is well named " The Land of the Many." Many peoples and many religions go to make up this great Empire, and there are also hundreds of different *castes* or classes, each of which refuses to mix with the others, and this, even more than the number of its inhabitants, makes India seem a vast and complex land.

Here are Indian native blacksmiths at work. Note the old man on the right, who has ceased work to take a puff from his hookah or water pipe. These natives always squat when at work.

The beautiful island of Ceylon has been named " The Pearl Drop on the Brow of India " by Eastern poets, but its people, plants and animals are so different from those of India that it must have been an island for countless ages past.

LOVELY SOUTH AFRICA, LAND OF FRUITS, FLOWERS AND GOLD.

Continuing our journey westwards we come to the Union of South Africa. Steaming round the Cape of Good Hope, once called the Cape of Storms, we shall at last anchor in Table Bay, whence a good view of Table Mountain is obtained. This " Monarch of the Peninsula," as Cape Town people call it, takes its other name from its flat top above which masses of white clouds are often hovering, giving it the appearance of being covered with a large white tablecloth !

South Africa has four chief parts, or provinces. In the south, round the coast, is Cape Province. Then there are Natal, the Transvaal, and the Orange Free State. The chief town of the Cape Province is Cape Town. This is the oldest town in South Africa, and a lovely place it is. It is sometimes called " The City of Flowers." There is the lovely Table Bay, with its blue, still waters, and a pier over a quarter of a mile long runs into the bay from the shore. From Cape Town a beautiful motor road leads to the Cape of Good Hope, with its lighthouse. Here ships must turn to the east to go round South Africa to reach Australia or India.

There are two towns in Natal which we must visit, if only for a moment. The capital is Pietermaritzburg, which is a town of fine buildings and wide streets. The sun shines down and makes everything seem clean and bright. There are hills outside the town, and here come the white folks of Natal when their own towns or villages are too hot.

These rickshaw boys are Zulus who run swiftly through the streets pulling their light carriages behind them. They have painted their feet and legs to imitate white socks.

A BRIEF GLIMPSE AT SOME OF THE SOUTH AFRICAN CITIES AND TOWNS.

Another fine town is Durban. It is one of the chief ports of South Africa, with a beautiful beach where holiday-makers come in their thousands. The weather is hot, but there is enough rain to make wonderful flowers grow in the parks and fields. The streets are wide and well made.

The chief town of the Orange Free State is called Bloemfontein. Here is a town with many thousands of people living in it, and

Cape Town nestles under the towering Table Mountain, which is often shrouded in a cloud—known as its " Tablecloth."

with fine buildings. There was plenty of space for building, when this town was made. Pretoria is the capital of the Transvaal, and is a lovely place, for there are trees and gardens almost everywhere. Johannesburg, also in the Transvaal, is a town of over two hundred thousand inhabitants, and the largest in South Africa. Its buildings, shops and hotels are splendid, and it has fine schools and colleges.

HOW IS THE AFRICAN GAME OF MUPILA PLAYED BY THE BANTUS?

A feature of the Cape Province is the series of plateaux rising one above the other and known as the Karroos. They are vast stretches of flat country, bounded in all directions by hills and mountains. The flat parts are called *veld* which is the Dutch name for "field." Rain only falls upon them between December and May, and then the farmers have to make artificial dams to hold some of the water for themselves and their flocks, to carry them through the long months ahead, when the sun shines down relentlessly day after day upon the veld.

Three types of African Native are shown above. The Matabele on the left comes of a race of true and fearless warriors. In the centre, at the salute, is a fine specimen of a Zulu chief, wearing his man's ring on his head. The dusky-skinned Swahili on the right comes from Zanzibar. His people also dwell in the big game territory of Tanganyika.

The northern boundary of the Cape Province is the Orange River, the greatest river in South Africa. During the winter it becomes just a narrow stream of yellow muddy water, flowing down the middle of its much broader channel. British Bechuanaland, to the north of this river, is for the most part a semi-desert region.

There are millions of "coloured" people in South Africa, all of whom live their own lives in their native villages contented and at peace with one another under British rule. In the Cape Province there are the Kaffirs, and Zululand in the north-east of Natal is the home of the Zulus. The Swazis, Gazas, and Basutos are the names of some of the other tribes. The natives also predominate in the other parts of Africa which belong to the Empire. The Bantus of Uganda in Central Africa are a very interesting race of negroes. The boys and young men play a game of ball known as *Mupila*. The ball is struck hard upon the ground by one player, and as it rebounds the other players clap their hands and jump up into the air. Then they all spring forward, and the one who catches the ball before it returns to the ground strikes it next upon the earth. Bantu children are named after the day of the week on which they were born, after any important event that may be happening at the time, or after any white man who may just then be passing through their village.

The Swahilis inhabit the coastal regions of Tanganyika Territory, and are also to be found in Zanzibar.

SOUTH AFRICA, THE HOME OF MYRIADS OF CATTLE AND SHEEP.

Of the white folks some are British, but many of them are Dutch people. The Dutch came to South Africa long ago, and their families have grown up there. The Dutch of South Africa are known as Boers. They are good farmers, but a good deal of the land is so dry that it is not easy to grow crops. Thousands of cattle and sheep roam about the wide open spaces, feeding on the short, dry grass. The black folks who live here also keep cattle.

Gold and diamonds are dug out of the ground. Wool is clipped from the backs of the sheep and used in the making of woollen clothes. Coal and iron are also found here. Tobacco plants can be grown, and the leaves are gathered and dried.

Wheat also grows, and Indian corn or maize as well, where there is enough rain. There are groves of golden oranges, and orchards shining with thousands of peaches and plums. In the south, at the very tip of South Africa, there are large vineyards. South Africa is a big land. There are wide plains and high ranges of mountains, and wonderful views are to be seen on every side. When it is winter in our own islands, the sun is shining brightly in South Africa, and the wide, open spaces are sprinkled with beautiful wild flowers.

"THE CITY OF PALACES" WHERE DARK-EYED NATIVES BASK IN THE SUNSHINE.

Steaming up through the Red Sea and the Suez Canal we find first Cyprus and then Malta in the Mediterranean Sea. The latter island guarding the narrow strip of sea between Sicily and Tunis on the African coast is known as "the gate to Egypt" and "the key to our Empire in the East." Valetta, the capital of Malta, is a beautiful city full of fine buildings which were built long ago by the Knights of St. John of Jerusalem. This "City of Palaces" is thronged by Maltese, a handsome race with olive complexions, the black-haired, dark-eyed women and girls wearing on their heads the national article of dress called the *faldetta.* This consists of a large piece of cloth or silk gathered over the head on a frame of whalebone to form a hood, and then falling down over the body as a cloak or shawl. In summer the faldettas keep out the heat, in winter the cold.

The Rock of Gibraltar. On this rock Barbary apes still roam. In no other part of Europe are monkeys found wild.
[*P. & O. Line*

The great Rock of Gibraltar guards the entrance to the Mediterranean, and soon afterwards we reach the British Isles, having in our journey round the world visited the greater part of Britain's scattered Commonwealth of Nations. From these small islands men set forth centuries ago to discover, colonise and build up the Empire. In the Great War, 1914-1918, their descendants flocked back to Europe and elsewhere to fight under the British flag, and in the farthest corners of our vast and wonderful Empire you will find men and women who still call England, Scotland, Wales and the Irish Free State, *home.*

The harbour of Valetta, Malta. Valetta was built by the world-famous Order of the Knights of St. John of Jerusalem.
[*P. & O. Line*

A PEEP AT OUR EUROPEAN NEIGHBOURS

One of the beauties of glorious Scotland is snow-capped Ben Nevis, the highest mountain in the British Isles. [*Wilson*

AGES and ages ago England was joined to the great continent of Europe by land, and men walked where now they must travel either by sea or by air. But very different were the nations and peoples in those far-off times from what they are to-day. What would be the thoughts of those first men who walked across the bridge of land now lying beneath the Straits of Dover could they re-visit the Great Britain that we know?

What a wonderful city is London, the greatest city in the world, with its many beautiful buildings, old and new. Up and down old Father Thames pass steam and sailing ships laden with merchandise and passengers coming from, or going to, almost every nation under the sun. No country possesses finer old abbeys, castles and colleges than ours, built in the days when men worked for the love of the working, and put their whole hearts into the carving and placing of every stone. And although other lands have scenery on a larger scale, yet ours possesses a beauty and a grandeur peculiarly its own. How lovely are our lakes! How splendid our mountains, of which Ben Nevis in Scotland is the highest and the finest! How wild and rugged are some of our coasts, at Land's End, for instance, where the waves of the great Atlantic beat day and night against the cliffs!

NORWAY has a finer coastline than this. If we sail up one of the fiords, or narrow openings in the Norwegian coast, with tall, rugged mountains rising up on either side, we might expect at any moment to meet a fleet of Viking ships, bound for one of those daring raids on other lands so loved by the Norsemen of old. Instead we only see some Norwegian peasants fishing or off for a peaceful sail. Norway is the land of the Midnight Sun, and it is an unforgettable experience to stand at midnight in the middle of summer upon the top of North Cape on the island of Mageree. This is the most northerly land in the whole of Europe, and in broad daylight, with the sun shining, we gaze northwards over the Arctic Sea towards the region of the North Pole. In the Norwegian town of Hammerfest, the most northerly town in all the world, with its houses, schools and churches all built of wood, the sun never sets between May 13th and July 29th, and never rises between November 18th and January 23rd! Timber and fishing are the chief industries of Norway, but agriculture is being developed, and you will often in summer see the people hay-making in the fields.

To the east is Sweden, a land of fertile soil and great lakes. Great forests of pine trees provide Europe with wood for building and there are huge match factories where pine trees end their days in match boxes. Sweden has rich mineral supplies, and sends iron ore to our own blast furnaces. Stockholm, the capital, is a stately city, built on islands where Lake Mälar overflows into the Baltic Sea. One of the gems of the city is its deer park.

In the north-east of Scandinavia, bordering on the Arctic Ocean, is Lapland. The Lapps, and their neighbours, the Finns, are descendants of the first people who inhabited Scandinavia before these were driven northwards by the great Teutonic race that invaded Europe a few centuries before the birth of Christ. The Finns are farmers, the Lapps are a more nomadic people, who hunt and fish, and move about with their great herds of reindeer and drive their sleighs over the ice and snow.

Russia is an enormous country covering eight million square miles of land, part of which is in Europe and part in Asia. Most of the people are peasants, working on the land, though in the towns large factories are busy making machinery, clothing, boots and shoes, and, indeed, almost everything needed by the country's inhabitants. For Russia is trying to improve its position in the world, and the people are working very hard. Moscow is the capital but a very old and important city is Leningrad. This city was once called St. Petersburg. Then its name was changed to Petrograd, and now it is changed again. Russia, too, is changing, but whether for better or worse time alone will tell. The people there are trying a big experiment in a new kind of government, and until the work planned has been completed no one can say whether these new ideas have been successful.

Everything is spick and span in Holland. Here are some of the children, neat and stiff in their white caps and aprons. They take off their sabots in school.

WHY DO THE DUTCH PAY SO MUCH ATTENTION TO THEIR COASTLINE?

" God made the sea, but we made the shore," is an old Dutch proverb, and for centuries the people of Holland have had to build and keep in continual repair great dykes or sea walls all along their low-lying coast to prevent their country from being flooded by the sea. These dykes are about sixty feet in height and broad enough for a road, buildings and trees along the top. Strong walls, too, have to be raised along the river banks and round the lakes, which often become flooded when the snow melts in the far-off Alps, and canals and ditches are built everywhere to prevent the land from being flooded, while much pumping of water is done by the many windmills that are a fine feature of the landscape. The windmills also provide power for milling corn and sawing wood.

CITY OF CANALS, ISLANDS AND BRIDGES—AMSTERDAM.

The lovely old city of Amsterdam is built upon many islands, and three hundred bridges cross the canals that intersect it ! Canals also connect Bruges, one of the many interesting cities of Belgium, with the port of Antwerp.

The Dutch are famed all over the world for their bulbs which provide us with bloom in the dark days of winter. They dress very quaintly, the men wearing wide trousers and loose blouses, and the women a number of bunched-up petticoats and little picturesque caps on their heads.

North of Holland is Denmark from which, long ago, the brave Danes embarked in their long ships, came to England and settled down in our own country. The fields in Denmark are thronged with cows, for it is this country which sends us butter and other farm produce. The Danes are a strong, hardy people, clean and tidy, and fond of hard work. Copenhagen, the capital, which means " Merchant's harbour," is a port from which many ships carry away the goods produced by the industrious Danes.

In the little hard-working country of Belgium the people use every inch of their land and spend most of their time cultivating it, working very industriously to earn their living. It is interesting to watch the barges gliding through the long waterways, drawn by horses from the paths at the waterside. Brussels, the capital, is a city of remarkable old buildings. Belgium in the Middle Ages was included

A quiet scene in the Black Forest in South Germany, a most picturesque part of the country. Note the quaint dwelling with the thatched roof, and the riot of flowers in the foreground. The people wear very quaint clothing in this district.

with Holland in the country of the Netherlands, and many of its romantic associations date back to those stirring times. Now it is so small that you can travel over most of it in a day. But what a gorgeous day's travel! Beautiful bridges, frowning fortresses, colourful flower-markets, picturesque peasants—no other country can offer you so much to see in so small a space.

THE LAND OF THE RHINE AND THE DANUBE—EVER-BUSY GERMANY.

When you find "Made in Germany" on your toys, tools, and household articles do you ever wonder what the country where they are manufactured is like? It is a land of large industrial towns and wonderful rivers. A tiny stream, rising in the snowy mountains of Switzerland, develops into the famous Rhine which forms a boundary between France and Germany. The Germans are very proud of this great river, which is over 700 miles long, and sing songs in praise of its beauty. The River Danube, too, is famous, though this is not entirely a German river, as it becomes larger when it flows into the lands to the east. The Germans living in the beautiful Black Forest at the south wear very picturesque clothing, quite different from what we see in our own country. Their head-gear, especially, is quaint, but it is only on Sundays and red-letter days that the people dress in fine clothes. German children are very good scholars, working hard at their lessons and learning to speak the languages of their neighbouring countries. Many of their lessons are done in the open air, for Germans strive to keep fit and hardy and to excel at sports. In Berlin, the capital, we find many fine buildings, beautiful streets and gardens. All over Germany there are many old and curious buildings which attract notice from travellers from all over the world.

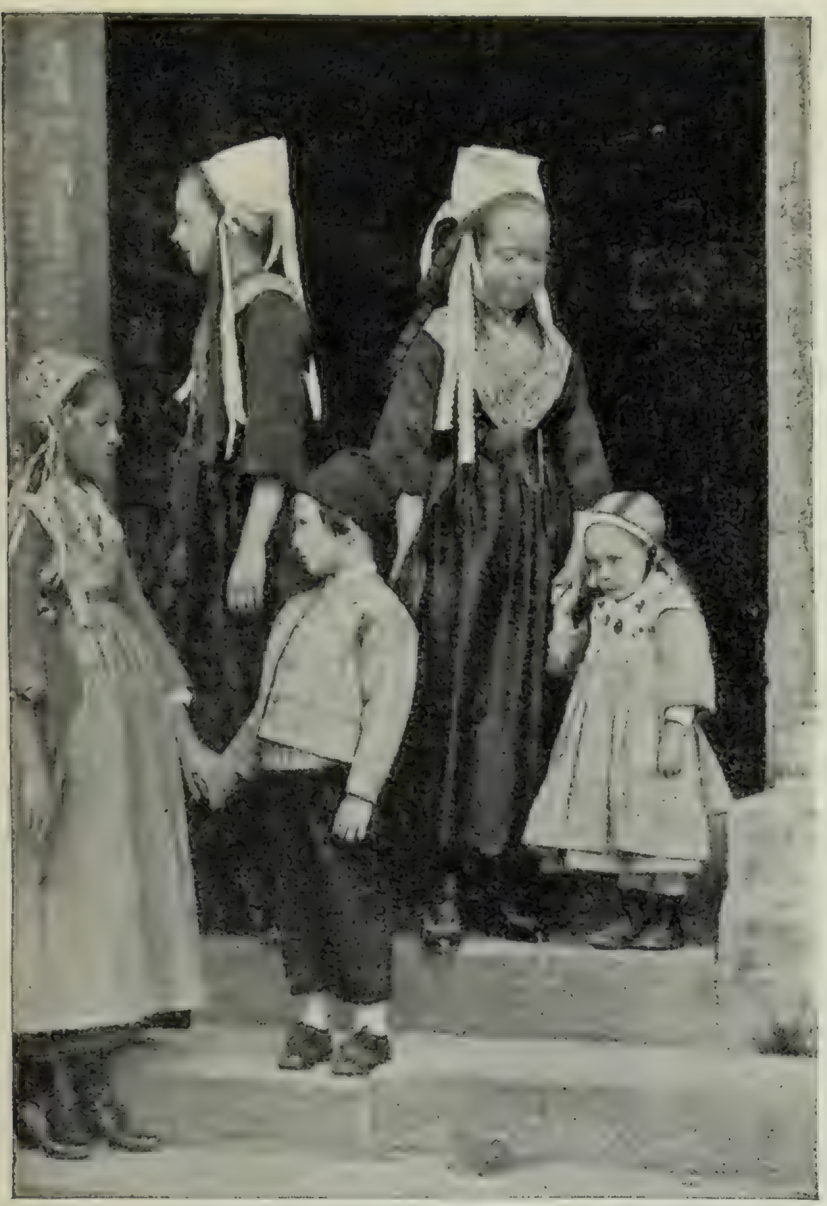
FROM BEAUTIFUL FRANCE TO THE TOWERING ALPS.

France, of course, is almost a next-door neighbour of ours, and it is divided from us by a tiny strip of water called the English Channel. In this country, the children often wear wooden clogs, called *sabots*, to keep their feet warm and dry. In the north are fields of corn and vegetables, while in the south are vineyards, from which the grapes are gathered and crushed for wine making. The beautiful city of Paris, on the River Seine, and famed for its wonderful buildings, is the capital of France. Here are many fine bridges and wonderful streets lined with trees. Eiffel Tower, the world's highest tower, is here.

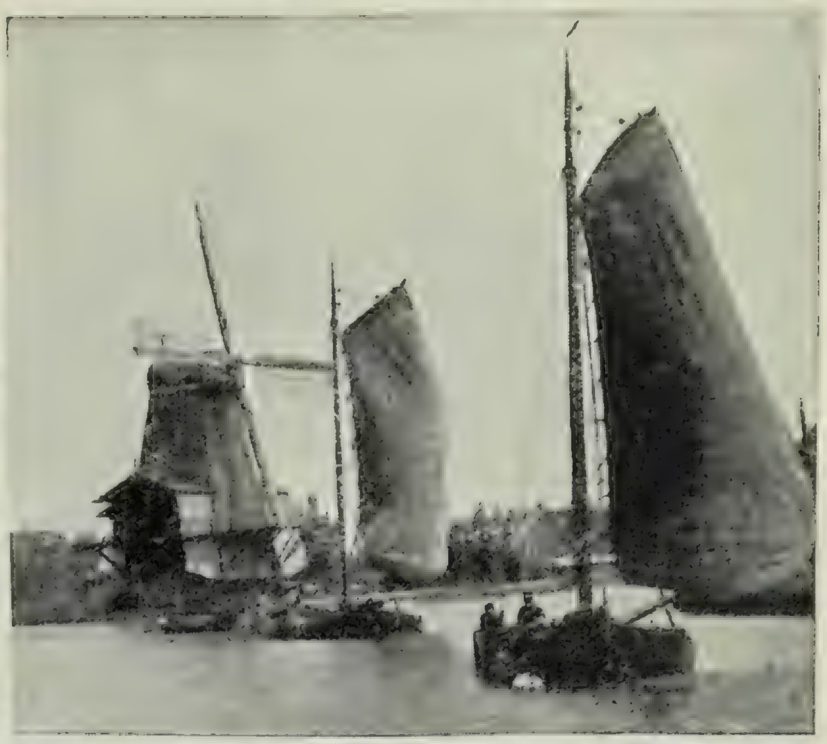
Switzerland is as mountainous as the Nether-

Delivering letters on skates. German postmen combine work with winter-sports. This scene, taken near Berlin, shows how severe the weather can be. Even the children are wearing skates, as they make their way to school.

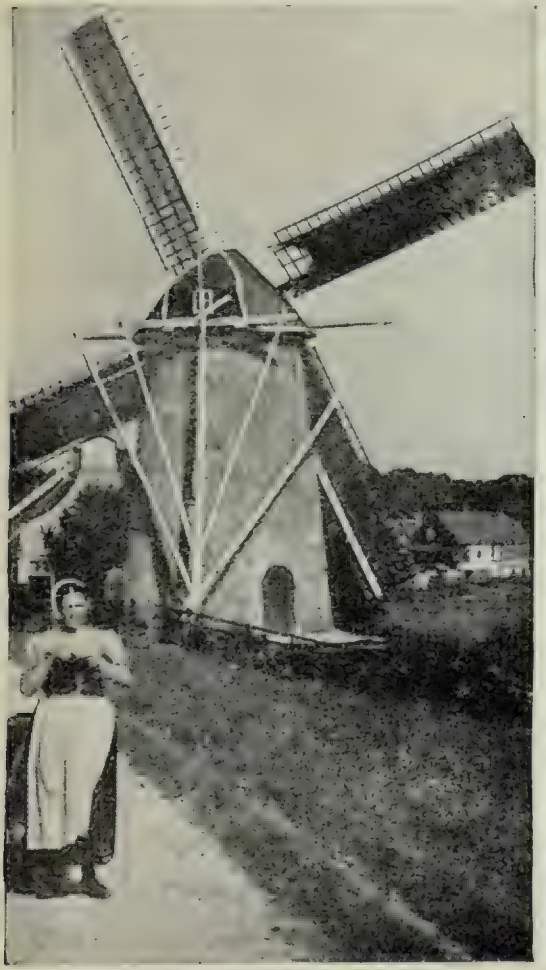
WHERE DYKES AND WINDMILLS HOLD SWAY



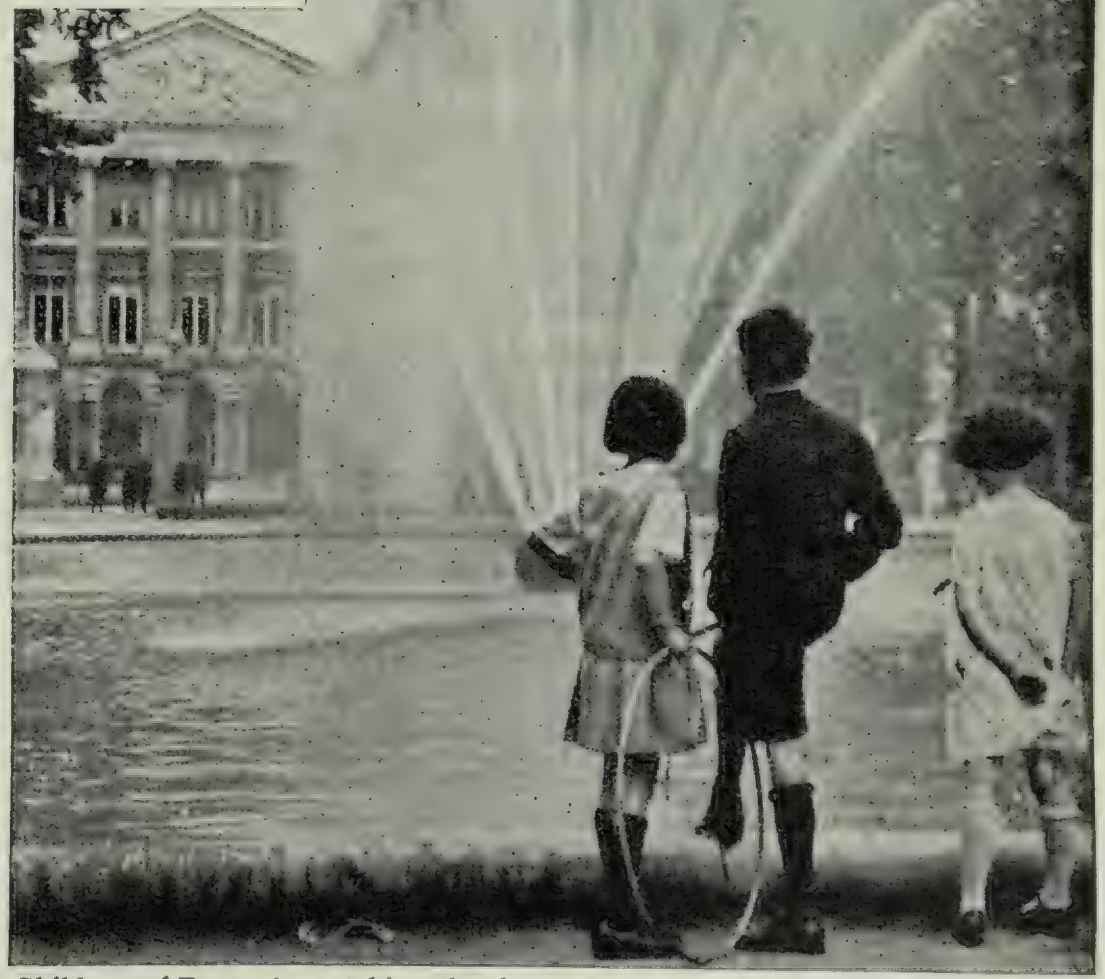
A group of Breton peasant children in holiday attire. On festival days they wear richly-embroidered dresses and quaint caps.



Holland is the land of many waterways. Here we see barges conveying goods along a canal. [*Will F. Taylor*



Mills pump water to drain the land for the people of Holland. The Dutch girl is busy with her knitting.



Children of Brussels watching the dancing waters of the fountain in the Royal Park. The Belgian Parliament House is behindthe spray in the background. [*Donald M'Leish.*

The giant which towers over Paris—Eiffel Tower, the third highest building in the world. Eiffel, who built this famous tower, occupied a room in the building for many years.

lands are flat. This little country, with its population of only slightly more than half that of London, has maintained its sturdy industrious independence through the centuries, chiefly owing to the protecting Alps. It is these splendid mountains that attract people thither at all seasons of the year, and from all countries, to climb them, and indulge in skating, ski-ing and the other sports and pastimes that such a mountainous land affords. A wonderful blue is the sky above the peaks of dazzling white, with the dark and paler greens of forest and meadow on their slopes. In the springtime and summer these meadows are gay with the loveliest flowers. Streams leap and dance merrily in most of the valleys, while great glaciers or rivers of ice move imperceptibly down the mountain sides. Sometimes the silence is broken by the thunderous roar of an avalanche, a great mass of snow that suddenly slips down a mountain, carrying with it anything that happens to be in its way. Beautiful as the mountains are in the daytime it is at sunrise and sunset that they are most glorious, when snow and sky become bathed in wondrous colours of rosy red and gold. Of all the Alpine peaks the Matterhorn, with the little town of Zermatt nestling beneath it, is the most impressive to behold and the most difficult to climb.

THE ETERNAL CITY, ONCE THE CENTRE OF THE WORLD.

Through one of the wonderful tunnels that have been made right through the Alps, or, better still, by one of the great passes over them, we come into Italy and visit those beautiful lakes, Maggiore, Como, and others which nestle beneath the mountains on the Italian side. Then journeying southwards through warmth and sunshine, little white villages, happy people, gay flowers and fruitful vines, we reach Rome, upon the River Tiber. So old is Rome, so full of past and present grandeur, that is is known as the " Eternal City." Here we can visit the great Cathedral of St. Peter's, the largest church in all the world, with its wonderful dome, and its paintings and sculptures by the greatest artists who have ever lived, including such masters as Raphael and Michelangelo. Only ruins remain to show us what the Eternal City was like in the days when, as centre of the mighty Roman Empire, she was mistress of the world. But these ruins are magnificent enough, especially those of the Forum, the centre of Ancient Rome, where parts of the magnificent temples that once stood here can still be seen.

In Italy, too, we must visit Venice, that loveliest of fairy cities, built entirely upon islands rising out of the sea, where all the

All roads lead to Rome ! The Appian Way, fringed by pines and stately cypresses, was once a great highway leading to the world's most noble and important city.

SLEEPY CANALS AND THE BABY RHINE

The city of Amsterdam, which was built on many islands. Over three hundred bridges cross the tree-lined canals.

Reflections in the still waters. A canal scene in the old city of Bruges which is sometimes called "the dead town."

The Rhine in Switzerland. Here the river is still small and winds its way between snowy mountains. It is too swift and too shallow to carry boats. Notice the ruined castle on a hill above the river valley sheltered by hills.

THE LONELY MAJESTIC SUMMIT OF MT. BLANC

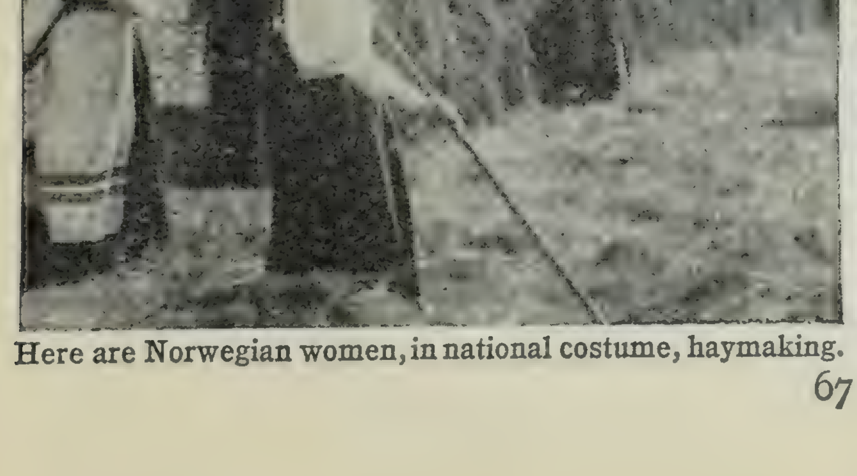
The monarch of the Alps is Mount Blanc—truly worthy of its name—" White Mountain." It rises to a height of 15,781 feet above sea-level, and pierces the clouds with its proud summit. This giant of the Alpine mountains is in France. [*P.F.T.*

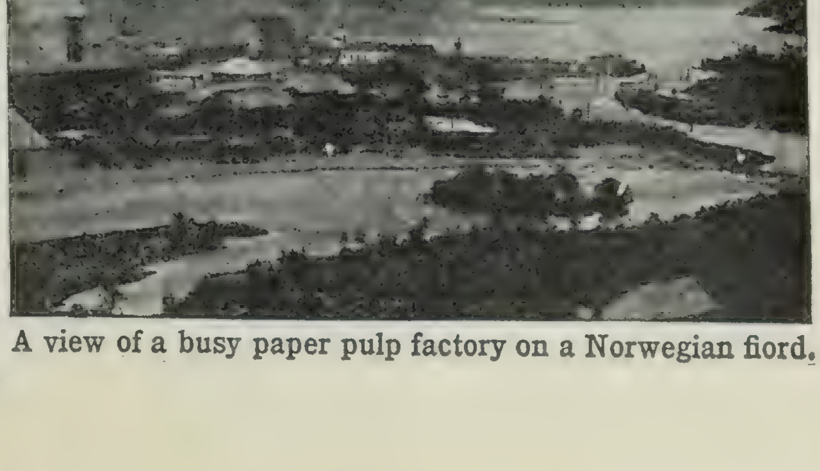
MOUNTAIN, FIORD AND PLACID LAKE

High up among the hills of Norway. Note the fine waterfall, coursing rapidly down the mountain-side.

A restful picture of a beautiful Norwegian fiord which mirrors the mountains in its waters.

Enchanting Lake Maggiore is partly in Switzerland and partly in Italy. Gardens of fruit trees grow around its shores.


Here are Norwegian women, in national costume, haymaking.


A view of a busy paper pulp factory on a Norwegian fiord.

SCENES BRINGING MEMORIES OF GREATNESS

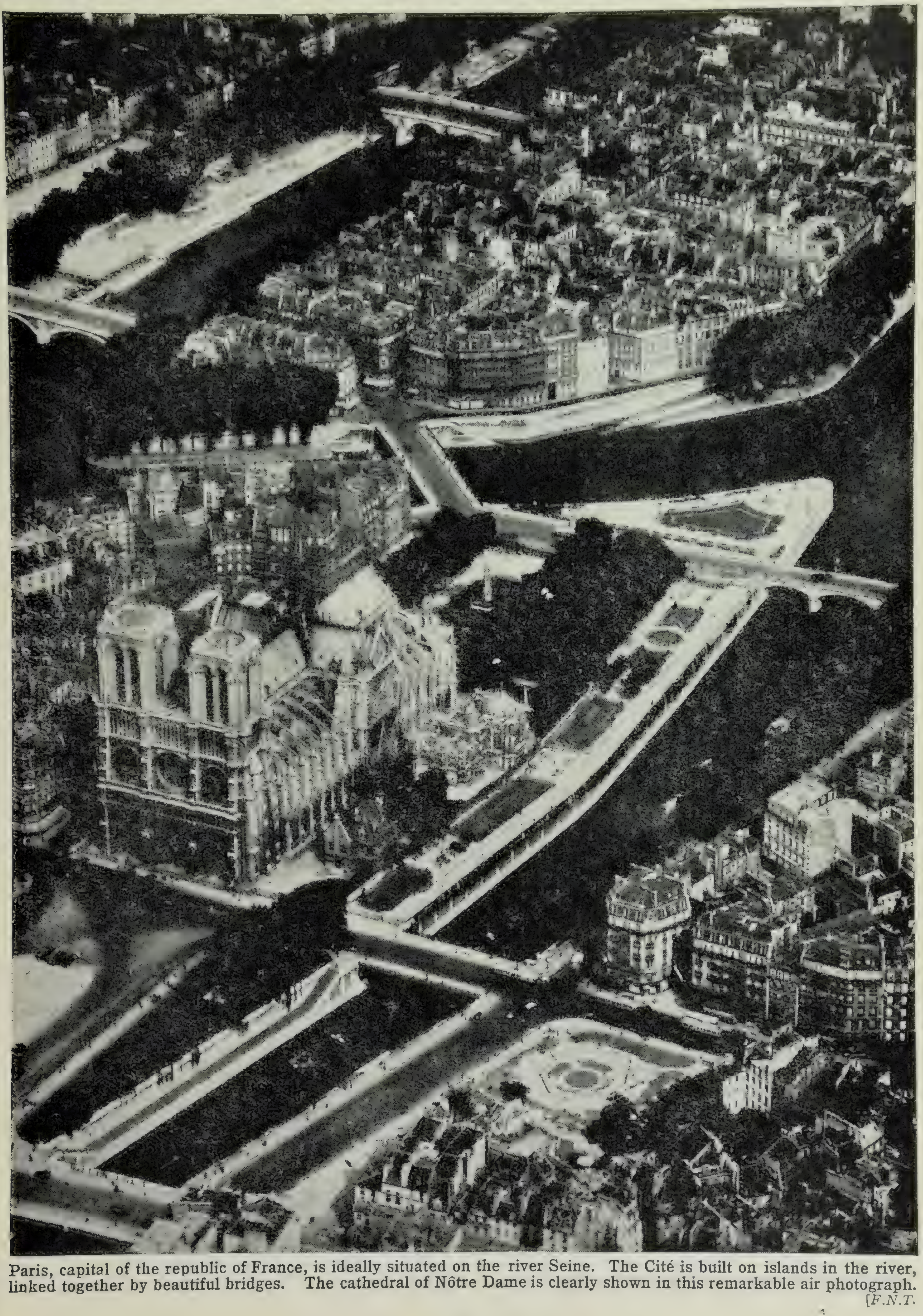
Moscow was once a city of churches of curious styles of architecture. To-day many of the churches have ceased to hold their services. Russia to-day has officially decided to discourage religion and the magnificent old buildings stand silent witnesses to the faith of pre-war Russia.

Ruins of the ancient temples of Athens. We see in the background the Acropolis with the ruins of the Parthenon.

Above we see a bridge over a canal in the lovely city of Venice, with curiously shaped gondolas gliding silently beneath it.

The world-famous River Tiber flowing calmly through the ancient city of Rome. In the background we see the dome of St. Peter's towering above the city, and the fort of St. Angelo stands like a sentinel on the right.

PARIS—HISTORIC CITY OF BEAUTY AND LIGHT



Paris, capital of the republic of France, is ideally situated on the river Seine. The Cité is built on islands in the river, linked together by beautiful bridges. The cathedral of Nôtre Dame is clearly shown in this remarkable air photograph. [*F.N.T.*

The ruins of Pompeii. In the background we see Mount Vesuvius, which was responsible for the destruction of this town long ago. The smoke can be seen rising from the volcano, which is very dangerous in eruption.

streets are formed of water, and one goes travelling, shopping or visiting in a gondola, passing continually beneath bridges, for nearly four hundred beautiful bridges cross the one hundred and fifty canals. Naples, on the edge of the blue waters of the Mediterranean, with its lovely bay, and Vesuvius rising up behind it, and often belching out clouds of smoke, must not be missed. The ruins of the ancient town of Pompeii close by show what havoc the eruption of such a volcano can sometimes do. The wonderful old towns of Genoa, Florence and many others, all call to us to visit them ere we bid farewell to Italy and her people of the joyous, light-hearted Latin race.

A SOUTHERN LAND OF COLOUR, OF MUSIC AND OF BEAUTY.

Spain and Portugal, the lands of sunshine, flowers and fruit are very much alike, in many respects. Spain is one of the most picturesque countries in the world, full of gay colours and beautiful flowers. The Spaniards themselves are a good-looking race, and the stately ladies, with their high combs, lace mantillas and flowers in their hair, are full of graceful beauty. Everybody moves slowly in these sunny countries where there is no cold air to stimulate them, and as a rule they are much fonder of pleasure than hard work. They are by no means idle, however. Many workers are employed in the large orange-groves, and the fruits from Spain are world-famous. In Portugal, too, wine is made from the grapes which grow in the vineyards, and Portuguese fishermen catch sardines which are tinned and sent to many countries. Both Spain and Portugal are famous for their bull-fights, and the people throng in crowds to watch this cruel sport. They are also passionately fond of music and dancing, and these countries have produced many world-famous musicians. Though Spain, with its orange-groves, palm-trees and blazing sunshine, looks like fairyland, it is not always a comfortable country to live in. In summer, when the heat is excessive, the rivers dry up and the farmers find it difficult to water their crops. Yet we have this heat to thank for the oranges, lemons, pears, peaches and apricots which are sent to us from Spain.

ITS GLORY IS DEPARTED, BUT THE STONES BEAR WITNESS OF ITS GREATNESS.

Southwards still to Greece, another land of gloriously blue skies and bright sunshine, where oranges, lemons, currants, olives, figs and tobacco are grown, and there are also to be seen many wonderful ruins of the country's former greatness. The Parthenon that once stood upon the Acropolis at Athens was the most beautiful building the world has ever known—everything in Ancient Greece was beautiful. In the British Museum you can see a model of this wonderful temple built to the goddess Athena, and also some real remains of this and other temples of Ancient Greece.

These are but a few of the many nations of which the continent of Europe is composed. Let us hope that some day all these nations, with their different peoples, will be united in a great bond of unity. Just as there is a United States of America, so perhaps there may come to be a United States of Europe, not all governed by the same ruler, all still retaining their independence, but united in a common bond of understanding sympathy and love.

The city of Cadiz in Southern Spain is one of the oldest cities in the world. It is a port with a fine harbour, and has two fine cathedrals and many beautiful buildings.

THE TEEMING MILLIONS OF FAR-FLUNG ASIA

Even in a cold, bleak land the children know how to smile. These young people live in lonely Siberia. This vast land is icebound in winter. The children above hold posies of wild flowers, so this is probably a spring photograph.

THE magic of the East! It greets us directly we pass from Europe into Asia, for the peoples of this vast continent are in many ways entirely different from those of the western world. Persia is full of magic, even the vast desert, crossed by many ranges of wild and rocky mountains, which occupies so large a part of the country and where travelling is still a hazardous undertaking. For often in the midst of the desert suddenly appear marvellous floating hills, lakes and valleys, and beautiful palaces, only to vanish as swiftly as they came, and it is out of these mirages that the old Persian story-tellers wove their wonderful tales. These tales still enthral the boys and girls who live in the cities in the midst of the desert—beautiful cities with gardens filled with the loveliest of flowers to make up for the barrenness of the desert outside them. The boys of Persia have much greater freedom than the girls. At school, when they have learnt the curious letters of the Persian alphabet, they have to read and learn by heart passages from the Koran, their only text book. As soon as a boy has read through the whole of the book—which, by the way, is written in Arabic, and of which he often understands very little—a feast is given in his honour, with a wonderful display of sword-dancing, and henceforth he looks upon himself as a man.

The people of cold and lonely Siberia are a mixture of many races. There are Tungusians, a race that originally lived in Manchuria, and wandered into Siberia. The Yakuts, a more hardy and industrious people, came from the south, fighting their way through the territory occupied by the Tungusians. They hunt and keep cattle. During the summer they live chiefly in tents and in the open, but in the winter they occupy curious houses with sloping walls of wood, covered with clay, and roofs of clay and peat. Still another race are the Gillaks, who live in the Amur valley, and are a very ancient people, being related to the Ainus, the early inhabitants of Japan. A wonderful railway crosses Siberia, running from Moscow to the Sea of Japan, and bringing every year thousands of emigrants from Russia.

ON THE ROOF OF THE WORLD WHERE THE WIND IS LIKE A KNIFE.

THE most interesting country in Central Asia is Tibet. It is a high tableland, lying between the Himalayas and the Kwen Lun Mountains, eleven times as large as England and Wales, and in most parts three miles above the level of the sea, with many peaks higher still. It is one of the most desolate countries in the world, so cold, and with a soil so poor, that barley is the only crop that will grow. There is even hardly enough air to breathe, although an icy wind is always blowing like " a thousand knife points," that will pierce any clothing. The people of necessity live in extreme poverty and discomfort. The lower part of a Tibetan hut or house is a stable, the living-room is above, with no windows, but a round hole in the ceiling through which light enters and the smoke of the fire goes out. If you paid a visit to such a home you would be greeted by the family putting out their tongues and each pressing forward one of his ears to you, while they cried out, " Tashidelhi, Tashidelhi !" You would then sit round the fire on sheepskins and woollen rugs and be served with tsampa or barley which has been roughly ground in a stone mill and mixed with grit as an aid to digestion, and buttered tea. This last is a mixture of Chinese brick tea, stewed with butter and salt !

IN addition to the ordinary tillers of the soil, Tibet is the home of a vast number of priests or monks. It is said there are as many as 20,000 of these, living in the monasteries where they worship Buddha. The chief of the priests is the Dalai Lama, the ruler of Tibet, who lives in a wonderful white palace built on the crest of a hill a short distance from Lhasa, the capital of the country. The roofs of the palace are of glittering gold, the centre is a blaze of crimson. Inside it is crowded with treasures of untold worth brought by the thousands of Buddhist pilgrims who journey from China and India to do reverence to the Dalai Lama and worship at the holy city of Lhasa. At least one son out of every Tibetan family becomes a priest or lama, and lives a life of seclusion, peace and prayer in a monastery. If you were to visit a lama you would greet him by placing the silken scarf of friendship, called the *kada*, on his shoulder, and he would do the same to you. On leaving you would say to him, "Remain seated," which is the Tibetan form of farewell, and he would reply to you by saying, " Go away slowly."

TIBET—THE LAND WHERE THE NATIVES SMILE AND SING UNDER ALL DIFFICULTIES.

You may be surprised to hear that the people of Tibet are some of the happiest in the world. Their terrible climate and scarcity of food has no power to damp their wonderful spirits. They laugh and sing all the day long. This, no doubt, is largely due to their religion, for one of the many beautiful things that the great Buddha taught was the duty and value of cheerfulness in all circumstances of life.

Although the Buddha was born, lived and gained enlightenment in India there are comparatively few of his followers in that country to-day. The majority of the people are either Hindus or Mussulmans. Nearly three-quarters of the three hundred and fifteen millions of India are Hindus, worshipping a vast number of gods, some gods being worshipped in one part of the land, others in another. Of the animals that the Hindus look upon as sacred the most sacred is the cow. Cows may wander as they like through the streets of Benares and other cities, even helping themselves to food from the shops, and no one will hinder them. To kill or injure a cow is a great sin in the eyes of the Hindus. The Mussulmans or Mohammedans, on the other hand, of whom the majority of

Burma is a land of tinkling temple bells. The picture shows the famous temple of Shwé Dagon, at Rangoon.

the other quarter of the people are composed, look upon it as a sin to hold animals sacred, or to worship gods in the form of images as do the Hindus.

All over India are to be found marvellous buildings—palaces and tombs built by the old rulers of the land. Of these the Taj Mahal at Agra is the most wonderful and beautiful. It is, indeed, one of the most beautiful buildings in the world. Built by the Mogul Emperor, Shah Jehan, as a memorial to his beloved wife, it took twenty thousand men—among whom were the finest artists and craftsmen India could produce—nineteen years to perfect the "Crown of Palaces," which is the meaning of the Indian name, Taj Mahal.

CHINA, THE MYSTERIOUS LAND OF UNTOLD MILLIONS, HAS A LONG HISTORY.

Burma, the largest of the provinces of India, is called the "Land of Pagodas," for every village possesses its pagoda or temple built for the worship of Buddha. The most wonderful and beautiful is the Shwé Dagon Pagoda at Rangoon. It is entirely overlaid with gold, hence its name, for "shwé" means "golden."

China is a country twelve times as large as the British Isles, with more than three hundred and twenty million people, people who still live in very much the same way as did their ancestors of thousands of years ago. For the Chinese revere their ancestors, even worship them, and think that what was right and good for them is right and good for the people of to-day. They are only just beginning to wake up to the fact that a country and people must change their modes of living in many ways if they are to progress. Now, instead of staying at home in their own land, as they did for centuries, young men of China are going to Europe and the United States to study, and bring home new ideas and customs to their motherland.

THE GAY CHINESE DELIGHT IN THE FESTIVAL OF THE FULL MOON.

The ruling class in China came for long from the Manchus, a race who conquered the country in 1644, and amongst other things introduced the wearing of pigtails into China. If you were invited out to dinner in a Chinese family you would have to use chopsticks instead of knives and forks, and no doubt you would not be nearly so clever as your hosts in conveying your food to your mouth without dropping any into your lap or on to the ground! You would eat rice, and pieces of pork, chicken, fish and vegetables out of separate bowls, and there would probably be some flour balls cooked in sugar. Chinese people are very polite and ceremonious. They would not kiss or shake hands with you. Instead they kotow or prostrate themselves, and salute one another with joined hands.

Leisure seems to agree with this sweet little Burmese girl. The quaint little bun on the crown of her head shows the peculiar Burmese method of hairdressing.

There is no weekly rest day in China, but many festivals are kept with great rejoicings. The chief of these is New Year's Day, when new clothes are donned, and before which everybody is supposed to have paid all his debts! There are also the Festival of the Full Moon, the Feast of Lanterns, and the Festival of the Dragon Boat. This last is held to appease the great dragon believed by the Chinese to rule over the sun, moon and stars, and who is supposed to swallow the sun or moon when there happens to be an eclipse of either. Chinese lanterns are a great feature of all the festivals. Another favourite pastime of these light-hearted people is kite-flying, and in China you can see grown-ups as well as boys enjoying this sport. Their popular indoor games are cards and dominoes.

The Chinese do not show their emotions in their faces. Note the solemnity of expression on these men who are intent on eating their rice with chopsticks. [*E.N.A.*

"EAST is East, and West is West, and never the twain shall meet," wrote Rudyard Kipling, meaning by these words that so great are the differences between the peoples of the Eastern and Western parts of the world that any real union between them is impossible. But he was surely mistaken. To-day the East and the West are drawing nearer to one another than they have ever done before, and are beginning to realise that each possesses many things that the other lacks. No longer do the majority of the white people look down upon the coloured races and vice versa. The Western peoples are the more practical in their actions and outlook upon life, the Eastern the more dreamy and mystical. But action and dreams must walk hand in hand if anything of real and lasting value is to be accomplished in any walk of life. And when East and West are walking forward together in a real bond of unity and fellowship, then will mankind have made a very big step forward towards its ultimate goal.

THE NILE MADE EGYPT, THE MYSTERIOUS LAND OF ROMANCE

It is the mighty River Nile that makes life possible in Egypt, one of the most interesting of the countries in the great continent of Africa. When, in the spring and early summer, the snow melts on the tops of the mountains in Abyssinia and East Central Africa a vast quantity of water comes rushing down into the Nile, until it overflows on to the land on either side of it. When the river later returns to its proper channel it leaves a rich deposit of mud behind it, in which the people can grow their crops. This has been happening for countless ages, and when our own islands were inhabited only by wild, untamed folk, Egypt was a great, powerful and civilised nation. To-day remains of this greatness can still be seen in some of the most wonderful ruins and monuments in all the world.

The Sphinx ! There is magic in the name, as there is upon the inscrutable countenance of what is most likely the oldest statue in the world. The "Father of Terror," as the Arabs call the Sphinx, with its human head and animal's body, is entirely carved out of a mass of solid natural rock, except the forepaws, which are formed of blocks of stone. Who built it, and when and why, will never be known, but there it stands, gazing out over the desert, as it has been for thousands of years.

THE MIGHTY PYRAMIDS, WHERE ALL-POWERFUL KINGS OF EGYPT SLEPT.

We know who built the pyramids—the Pharaohs of Egypt, as tombs for themselves after death. For the religion of ancient Egypt laid great stress upon the importance of preserving people's dead bodies, and so successful were the Egyptians in embalming, that many of these mummies exist to-day. It is said that one hundred thousand slaves took part in the building of the Great Pyramid for King Cheops, or Khufu, and we can well imagine this to be true. It is faced with huge stones of granite, which were quarried at Assuan, and then brought down the Nile a distance of several hundred miles. After that they had to be dragged and rolled and pulled across the desert beneath a burning sun, and the skill and labour that then placed them in position were marvellous indeed.

The ruins of the great temples are marvellous too, with their walls and pillars covered, as are

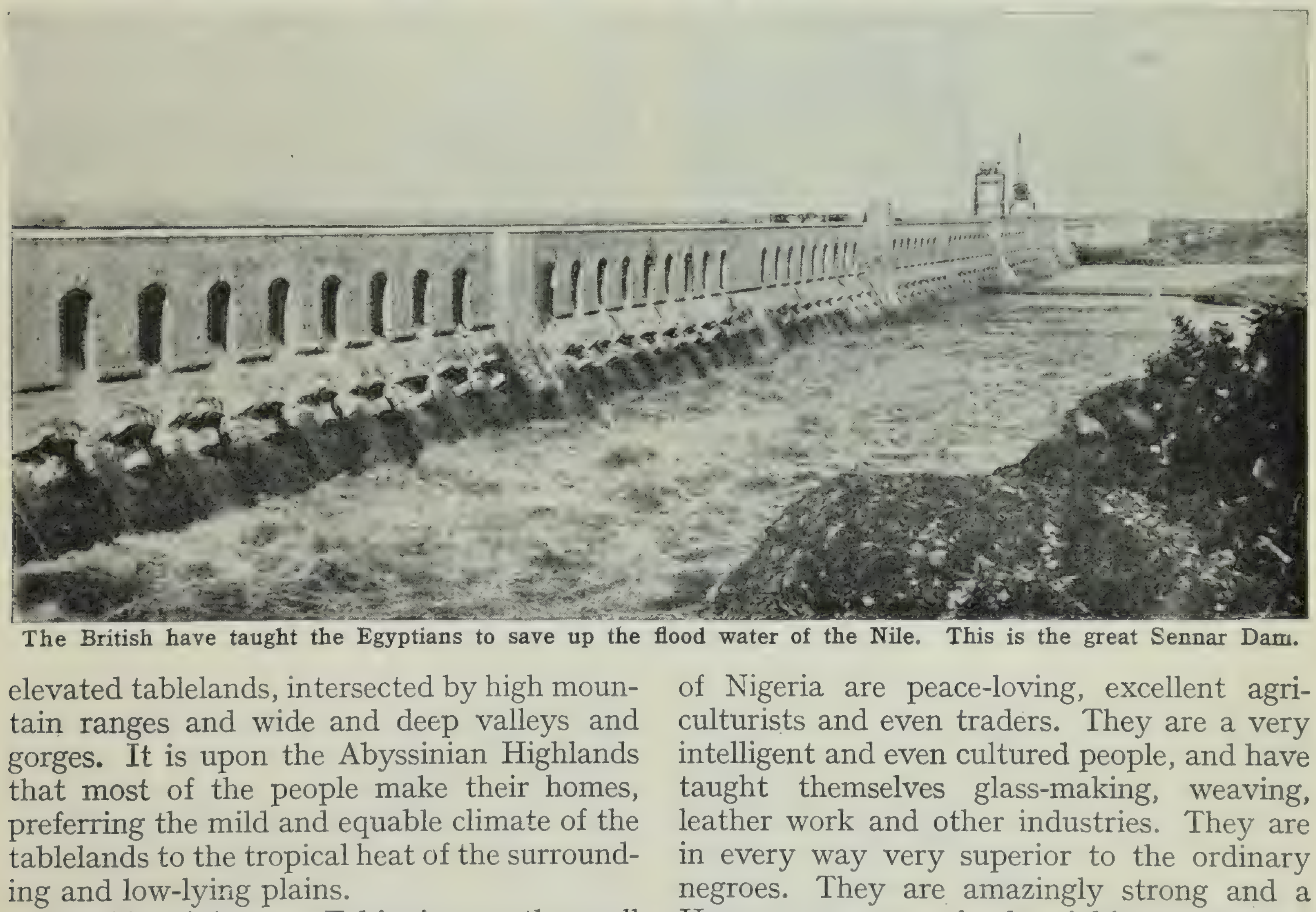
The Suez Canal enables ships to go to India and the east without the delay of a journey round Africa. *"Egypt and the Sudan"* also the tombs, with hieroglyphics, that strange picture-writing of ancient Egypt which, once it was deciphered, unfolded to us the story of the life and customs of this most wonderful people of the past. The Egyptian peasants of to-day live much as they did in the time of the Pharaohs.

SOUTH of Egypt is the territory known as the Anglo-Egyptian Sudan, through which flow the White and Blue Niles, fertilising the country on either side of them. At Sennar a huge dam has been built across the Blue Nile, by means of which the water above the dam is always at a high level, and is dispersed over the surrounding country by irrigation canals.

Another exceedingly interesting country is Abyssinia, for the most part a region of elevated tablelands, intersected by high mountain ranges and wide and deep valleys and gorges. It is upon the Abyssinian Highlands that most of the people make their homes, preferring the mild and equable climate of the tablelands to the tropical heat of the surrounding and low-lying plains.

The Abyssinians, or Ethiopians as they call themselves, are of a chocolate-brown colour, with black, somewhat curly hair, and features rather like those of Europeans. Most of them live in villages, built upon the tops of hills or on other high-lying ground, in *tukuls* or round huts. The walls of a tukul are formed of sticks plastered over inside and out with mud. The roof is in the shape of a cone, and is made of sticks or cane, tightly bound with strips of bark, and thatched. The roof extends for a good distance beyond the wall of the hut so that the heavy rains which fall during the rainy season can easily run off. A tukul consists of one room divided into two parts by a large piece of sheeting hanging across it upon a string. In the outer part the family live, eat and cook during the day, and at night it becomes the stable for the ponies, mules and other domestic animals, when the basket-table and few tools which are the only furniture are moved to one side. The family sleep in the inner part of the tukul on beds of wood and grass, covering themselves with the skins of animals.

Amongst the vast number of negro and other dark-skinned races that inhabit Africa, the Matabeles of Southern Rhodesia are a warlike people, while the Hausas of the northern part of Nigeria are peace-loving, excellent agriculturists and even traders. They are a very intelligent and even cultured people, and have taught themselves glass-making, weaving, leather work and other industries. They are in every way very superior to the ordinary negroes. They are amazingly strong and a Hausa can carry a load weighing a hundred pounds—even two hundred—upon his head for a long day's march without getting tired!



The British have taught the Egyptians to save up the flood water of the Nile. This is the great Sennar Dam.

AFRICA possesses some of the most marvellous scenery in the world. Words cannot describe the wonder and beauty of the Nile as it issues from Lake Victoria Nyanza at the Ripon Falls. Three thousand four hundred and seventy-three miles has this great river to flow from there until it empties itself into the Mediterranean Sea, for it is the longest river in Africa, and the second longest in the

Fifth Avenue, New York, is the most famous street of a wonderful city of skyscrapers. We are looking down on it from the top of one of these towering structures.

world. More wonderful even than the Ripon Falls are the Victoria Falls in Rhodesia on the Zambesi River. They are the greatest falls in the world, being two and a half times as high as those of Niagara. The thunder of the vast mass of falling water is heard long before they are reached, and tall columns of vapour rise from them into the air like smoke. The name given to the Victoria Falls by the natives who live near them means " Smoke sounds here."

MISSISSIPPI—THE GREAT WATERING-CAN OF THE UNITED STATES.

We have already visited Canada, that vast dominion belonging to the British Empire which occupies the northern half of North America. South of it lies the United States.

In the great central valley, watered by the mighty Mississippi, the Father of Waters, and its tributaries, grow most of the corn and wheat of the United States. They are then distributed all over the country by steamers and trains. South of the cornfields lie the cotton-growing states, one of the chief of which is Georgia, where great numbers of negroes of all ages find employment picking cotton.

New York, the commercial capital of the United States, is built upon a narrow island, and as room for building was limited, the buildings soared high into the air instead of spreading over the ground. Broadway, the chief street in this wonderful city, is so overshadowed by " skyscrapers " on either side of it that at some places the sun very seldom gets right down to the level of the street. One building in New York is over eighty storeys high —that is far higher than the tallest cathedral spire in this country ! This type of building is useful, but not beautiful, and one misses the lovely old buildings of London and other cities of the old world which were built in the days when men built for ornament as well as for utility, and such erections as skyscrapers had not entered their minds.

WASHINGTON, THE HOME OF THE AMERICAN PARLIAMENT.

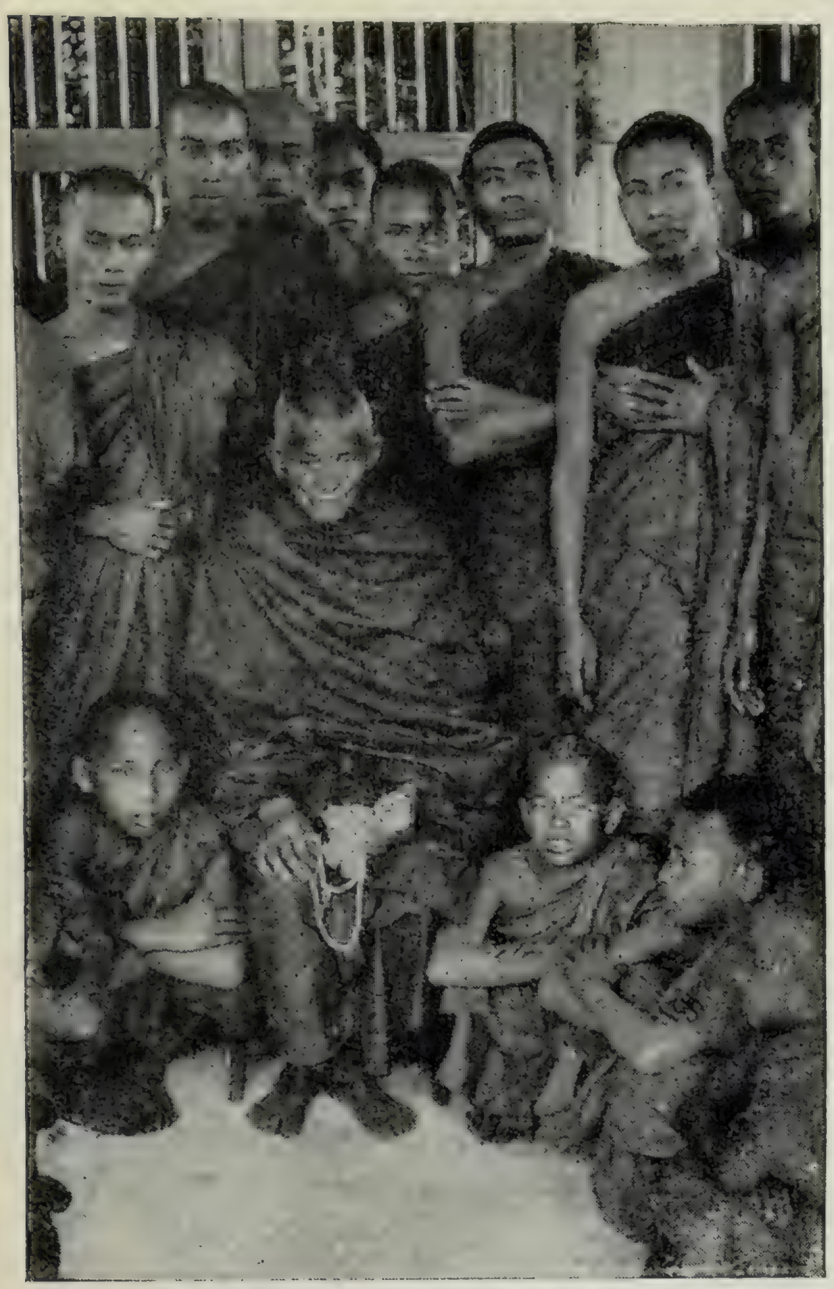
Washington, the capital of the country, is a much finer city. It was built after the United States became a nation, and the famous Declaration of Independence is kept in the Capitol, the American Houses of Parliament, where Congress meets to settle the affairs of the country. In Washington, also, stands the White House, where the President lives, and a fine tall obelisk points perpetually to the sky in memory of the great " father of his country " after whom the city is named.

From the United States we pass southwards into Mexico, a much older and a very different kind of country. Through it passes that mighty chain of mountains which, under different names in different countries, stretches from Alaska far away in the north of North America for thousands of miles to the extreme end of South America. There are many volcanoes in this chain, especially in Central America and Mexico. Popocatepetl, or " Smoking Mountain," in Mexico is nearly 18,000 feet high. Mexico is a wonderful and interesting country, with beautiful scenery and splendid towns and buildings.

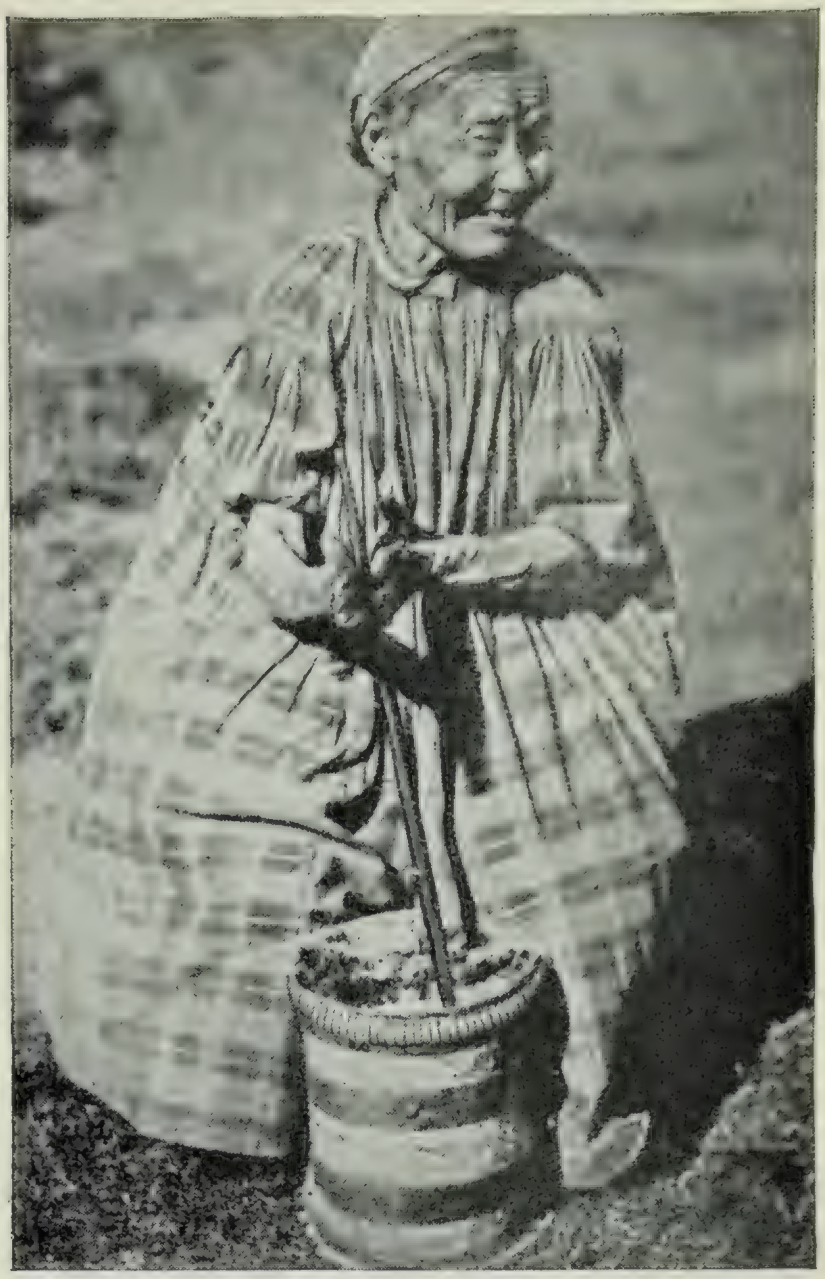
JOURNEYING farther south, we come to Panama, where the Panama Canal that has been cut through the isthmus divides the New World into two parts, and links up the Atlantic and Pacific Oceans. The making of it was perhaps the most wonderful feat of engineering that has yet been attempted.

The great country of Brazil occupies half of South America. It contains the largest

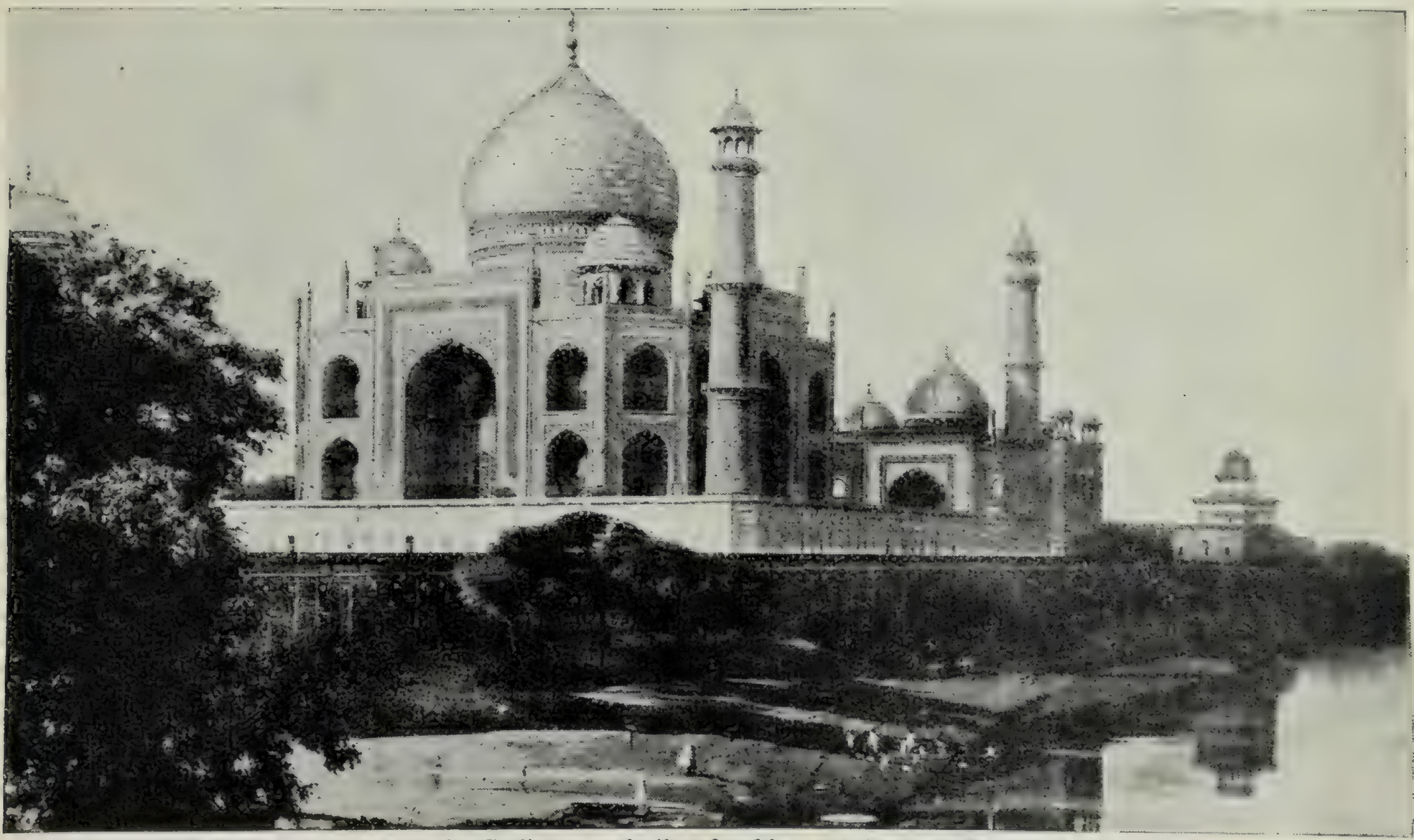
ASIAN POMP, PRIESTS AND PEASANTS



The temples of Burmah are directed by Buddhist priests, a group of whom, both old and young, you see here.



This old grandmother Yakut of Siberia smiles pleasantly as she makes butter in her primitive churn. [E.N.A.



The beautiful Taj Mahal at Agra in India was built of white marble as the tomb of an Indian ruler's wife.

The famous Christ of the Andes, which stands as an everlasting reminder that peace can settle national differences and that war is a foolish means to that end.

tropical forest in the world, from which all kinds of valuable wood and vast quantities of rubber are obtained, and sent all over the world. It is the home, too, of all sorts of wonderful animals, birds and insects, and in the clearings between the trees live tribes of savage and wandering Indians.

This forest is, also, the rainiest region in the world. Imagine almost the whole of Europe covered with a dense mass of palms, bamboos, figs, mimosas and countless other kinds of trees, bound together with almost impenetrable lengths of orchids and creepers, and you get some idea of what this great Brazilian forest is really like. Rio de Janeiro, the capital of Brazil, is the home of about a million people of all nations. The city is built around a fine natural harbour which is always full of ships from all parts of the world.

IN the west of South America, from Panama to Cape Horn, stretches the vast chain of mountains known as the Andes, a continuation of the Rocky Mountains of the northern continent. Even where they are near the Equator the peaks are always covered with snow, so high they soar above the level of the sea.

In the very heart of the Andes, thousands of feet up, there is a wonderful statue of Christ. It was erected to commemorate the peace between Chile and Argentina, and on the massive pedestal are carved these words: "Sooner shall these mountains crumble to dust than the Argentines and Chilians shall break the peace which, at the feet of Christ, the Redeemer, they have sworn to maintain."

In places the Andes are very, very wide, several chains running side by side, with high tablelands between them where are the sources of mighty rivers, and some great lakes. The largest of the latter is Lake Titicaca. It is half the size of Wales and lies between Bolivia and Peru. Many Indians live near this lake, and go sailing upon it in their *balsas*, or native boats made from the giant bulrushes that grow beside the lake, which are dried in the sun and tightly bound together in bundles. The sails are made of reeds, stretched upon a mast formed by two sticks.

THE Indians of these regions are called Incas, or "Children of the Sun," and are descended from the famous race that once inhabited Peru. The Incas were a marvellous

The llama is a beast of burden in Peru, and his wool provides clothing for his master. Here is a llama driver resting his pack animals in a little Peruvian village.

people, great warriors and splendid rulers. The great Inca Empire included the countries of Ecuador, Peru, Bolivia and part of Chile. They were marvellous builders, also, and all over Peru, the centre of their empire, are still to be seen ruins of their wonderful cities and buildings. The chief are at Cuzco, the "City of the Sun," the oldest city in South America, and the capital of the Inca kingdom in Peru.

Here, long ago, stood the palace of the emperor, and the more wonderful Temple of the Sun. It was covered all over with plates of pure gold, and on a huge altar at the eastern side stood a marvellous golden image of the sun, radiating rays of gold all round its head.

FOR the Incas believed that this city had been founded by Manco Capac and Occlo, his sister, children of the Sun, who had been sent down from Heaven by their father to some islands upon Lake Titicaca. Thence they journeyed northwards until they came to a beautiful valley, still high up amongst the mountains. Here the land was soft enough to drive in the sceptre of gold their father, the Sun, had given them, and here arose Cuzco, the City of the Sun.

The Indians of Peru, most of whom live high up amongst the Andes, keep llamas to provide them with wool for their clothing, and for carrying the goods they make to market. A llama, it has been truly said, "has a head like a camel, wool like a sheep, legs like a deer, and neighs like a horse." They have no humps, but their feet are like those of a camel, and are so made that they can climb up and cling to mountain sides too steep for even the sure-footed mules. The Peruvian Indians could not exist without their llamas, which they love and treat almost like their own children.

On the great lake Titicaca we see some of the native boats made of dried bulrushes, with reeds for masts. These queer home-made boats are frail but watertight.

Some of the Malays are finely featured. Look at this man's ears. He has cut the lobes and trained them into long loops, inserting bone ornaments above.

"DOWN under," at the opposite end of the earth to ours, there are, besides Australia and New Zealand, many other interesting islands. One of these is Borneo, the northern part of which belongs to the British Empire, the remainder to Holland.

The natives living by the coast are all Malays, and of the Mohammedan religion. They are a proud, independent people, living in large huts with walls made from bamboo or the bark of trees, and thatched with palm leaves, or the leaves of the rattan cane. Several families, sometimes an entire village, live in one of these huts, each family occupying one room opening off the open veranda which runs along one side of the house. The veranda is reached by climbing up a ladder, for each hut is raised some distance from the ground on strong wooden posts. So close are many of these huts to the water that the occupants can jump off the ladders into it!

These Malay villages are often situated at the spot where a river enters the sea, and the rivers are full of crocodiles, for which the swimmers have to keep a sharp look out.

The Malay children learn to swim before they can walk. The boys wear no clothes until they are twelve. Then they proudly don blue cotton trousers, and tie a piece of red or yellow cloth round their shaved heads. Their fathers are the barbers, and use the edge of a *kris* or sword in place of a razor for shaving ! The sons of rich men wear red fez caps, or hats woven from cane by the people who live up amongst the hills.

The Malays of Borneo go fishing in *gobongs*, primitive boats made from the trunks of trees, hollowed out by fire, and strengthened by bent branches nailed down inside them. Sometimes a small awning of palm leaves is erected as a shelter from the fierce rays of the sun, and beneath it two pieces of bamboo are placed across the gobong for seats. A large sail is fixed to a mast, and carries the gobong along so swiftly when the wind is in the right direction that the little boat often capsizes. But as all the occupants are excellent swimmers they soon have the gobong right side up again, and clamber back into it.

MORE Malays are found in the Malay Peninsula, a continuation of Burma. The island of Singapore, off the west coast of the peninsula, takes its name from the Malay word *singapura*, " the City of the Lion." This island, with the town of the same name, stands midway between China and India, and guards, like a British lion, the great shipping route between Australia, the Far East and Europe as it passes through the narrow entrance from the Malacca Straits into the Java Sea.

Most of the jungle with which the island was once covered has now been cleared away, and sago, indigo and other tropical products are grown in the hot, damp climate. Many of the native inhabitants of Singapore town live in barges in the harbour.

THE Fiji Islands are the most important of the Melanesian Islands in the Pacific Ocean east of New Guinea and Queensland. They belong to the British Empire, and the natives grow and live upon coconuts, breadfruit, bananas and other tropical products.

Little more than half a century ago the Fijians were cannibals, but now they are not only law-abiding, but they are keen to learn and love to dress as Europeans do. They even have native policemen to assist in keeping peace in the islands.

Fiji is not the only place where bananas grow, for in many other parts of the world these popular fruits are cultivated and form an important part of the diet of the people. It is said that the pygmies of the Congo forests in Africa eat over fifty bananas a day. Here is a load of bananas coming from the plantation. [*Elder & Fyffes*

Speeding over the Border. A Scottish express and an aeroplane have a friendly race across the Tweed.

JOGGING AND SPEEDING ROUND THE WORLD

Across the Seven Seas, along the highways of steel, over ribbons of unending roadways, and above the earth into the skies, mankind throughout the years has ventured and fought against the limits of time and space. As Travel by Ships, Trains, Motor Cars and Aircraft has developed, so have life and the things we can do broadened out for every one. Journeys which years ago took days and weeks can now be achieved in a few hours. New towns and cities, even in the wildernesses of the world, have grown to life through the vast developments in Travel and Transport. In this section the wonderful story of man's triumph on land and sea, as well as in the air and beneath the waters, is unfolded.

LOGS and rafts were the earliest and simplest means by which, long years ago, men, women and children moved along rivers and across smooth stretches of the sea. Next came the " dug-out " canoe, made from the hollowed-out trunk of a tree. But in places where large trees did not grow, or were not near enough to be launched or floated, frameworks of wood or bone were covered with hides or the bark from trees to make open-decked boats.

The Egyptians, Greeks, Phœnicians and Romans, fired with a desire to move across the waters of the world, made and used craft with decks. These vessels had not only keels and decks fastened by metal and wood, and were able to carry numbers of men, but they were also fitted with devices for rowing, sailing, steering and anchoring.

Three hundred years before the birth of Christ the Greeks had a navy with dockyards, from which vessels were launched, and six hundred years before this time the gallant Phœnicians built ships of war of the " galley " class. Giant oars were used to move these galleys along, often arranged in two or more " tiers " of rowers, usually slaves, who were drilled to work in unison.

From the tales of Greece it is learned that these early ships of the Mediterranean were at times fitted with a battering ram or beak which had three projections covered with a metal such as bronze. Driven with force against the side of an enemy vessel these rams tore holes causing the attacked vessel to sink or become disabled. As many as sixteen banks or tiers of rowers slaved in these early ships which carried a crew of anything up to two hundred men.

In Roman times the " galley slave " ships, were manned by men chained to each oar, and when such vessels were rammed or wrecked the slaves went down with the ship. About

The early Britons paddled round their lakes and rivers in home-made coracles. In the picture above we see one of these queer craft. Coracles are still used in India.

this time the Vikings in Scandinavia commenced building their famous ships with which to cruise the smooth, deep fjords and, in later years, to cross the North Sea to pillage and rob. One of these Viking ships was found near Oslo. It is 78 feet long, 16 feet 7 inches wide and 5 feet 9 inches deep. Sixty-four oars were used, and the crew consisted of no less than two hundred and forty men, several men being arranged to man each oar, which was much longer than in the craft used in the Mediterranean.

REALISING that the winds could be favourable and of great help in moving vessels along, the men of the sea learned through the years how to make masts and sails which would take the place of the oars altogether, and the long era of sailing ships dawned throughout the world. Progress was very slow, but, gradually and because the battles at sea still took place at close quarters, high observation structures were built at the stern or rear end of ships, and smaller "castles" were constructed at the bow or front, into which the crew were allowed to creep for shelter. This section of the forepart of a ship is still known as the "fore-castle" or "fo'c'sle" and is reserved for the use of the seamen.

Seamen too became more venturesome, and with the building of "caravels," which were broad-beamed, almost tubby, sailing ships, famous voyages of discovery were made from Spain and Portugal especially. In 1492 Christopher Columbus in the *Santa Maria* crossed to America. Five years later Vasco da Gama sailed along the African coast and around the Cape of Good Hope, and John Cabot discovered Newfoundland. Out into the unknown waters of the oceans these voyagers blazed new trails, and later regular trading routes for sailing ships became possible.

BUT all the merchant ships needed to be heavily armed. Piracy became fashionable, and many deeds of daring in which English seamen took part occurred on the wastes of the seas. At this time the best wood for building ships was English oak, and in the happy days of Queen Elizabeth English ships fared well with those of the other nations. To obtain greater speed ships became what is known as "fully rigged," that is, they had three tall masts carrying sails of square pattern. The word "ship," although it is now used to mean all kinds of vessels, is really the name for a craft of this type. Another aid to speed was the design of vessels which would clip or cut through the water, and a series of craft known as "clippers" came into use, making the sailing vessel a graceful and useful vehicle.

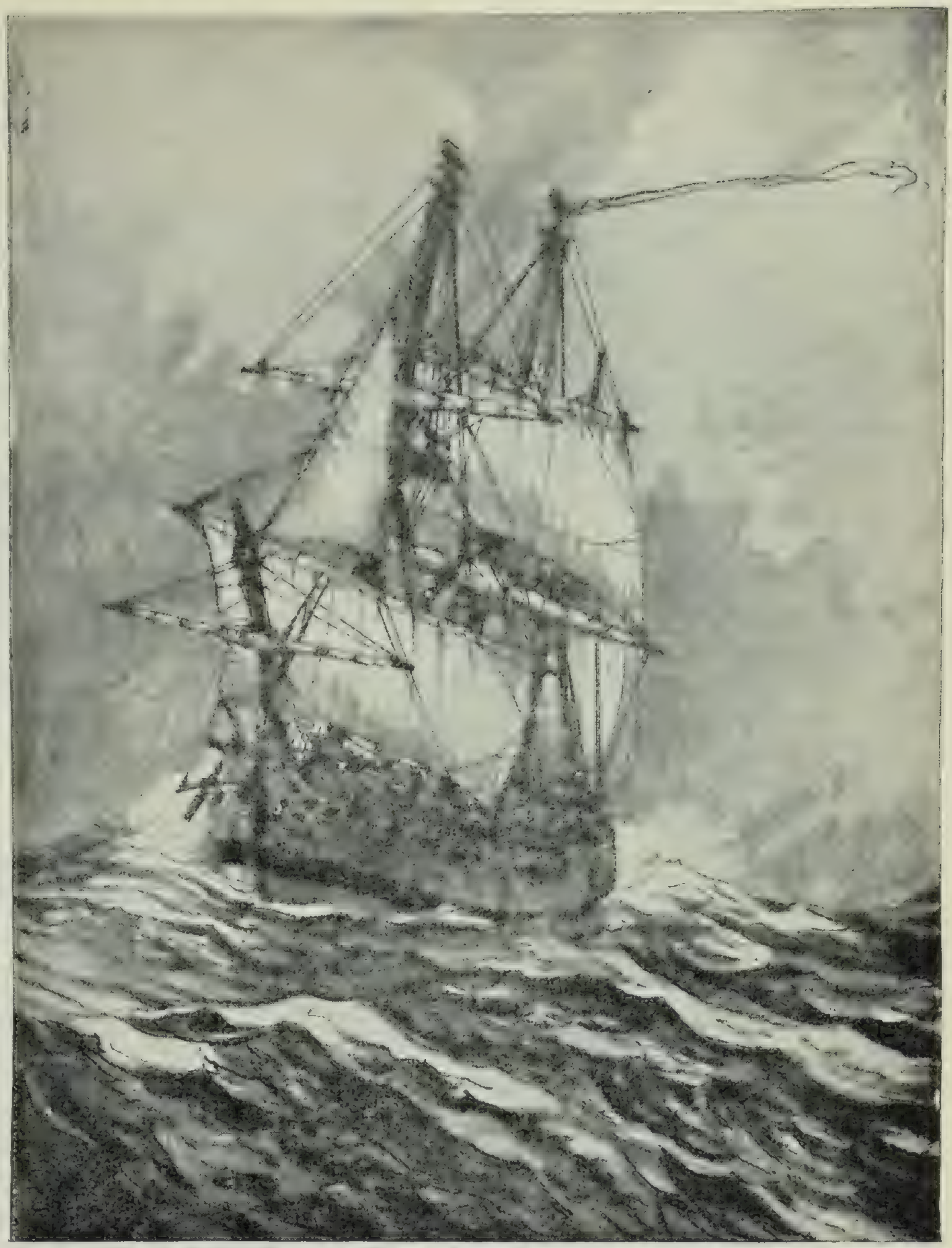
By this time fighting vessels and merchantmen or trading craft had become separate, and when dangerous occasions arose, trading vessels sailed in convoys with men-of-war to protect them. But the era of the wooden sailing vessel ended with the use of iron. Just over

Another primitive type of water-craft—a dug-out canoe, made by hollowing out the trunk of a tree. A paddle is used to force it over the water. These dug-outs are still used on inland waters by the South American Indians.

one hundred years ago iron shipbuilding was established, and in 1827 a Dutch vessel had the honour of first crossing the Atlantic by steam power, taking a month to reach the West Indies. In 1838 the steamer *Great Western* crossed from Bristol to New York in fifteen days, and two years later the first regular service was started by Samuel Cunard with four sister steamships.

THE ADVANCE OF SEA-CRAFT. SPEEDING UP SHIPS.

Planning out pathways and routes across the oceans, Cunard and his colleagues began a new era of travel, and it is from these days that the great businesses of liners and large ocean-going towns afloat, working to regular time-tables, have developed. Paddle wheels used in the early days of steam were followed by screws or propellers, iron gave way to steel, and with steel the idea of building bulk-heads or cross-divisions to make several separate water-tight compartments came into favour. Oil lamps were replaced by electric lighting, hand signalling by radio, and coal by oil, until the modern monarch of the seas can carry 3000 passengers, a crew of over 800 and many tons of cargo. Speeds have been increased until to-day the Atlantic has been crossed in 4 days 15½ hours, and New York is within five days of London aboard a vessel which gives every possible kind of comfort, and is more like a giant hotel afloat than anything else.



In the days of the Spanish Wars, Anson's eighteenth century sailing-vessel lumbered through the unknown seas. It is seen off Cape Horn, which in those days was a very perilous cape to round.

Aboard one of these modern ocean-going palaces, as the ropes are cast off and "she" sets sail, the population may be anything up to four thousand people. Some of these look after the wants of the passengers who travel in separated first, second, or tourist class sections of the vessel, whilst others are engaged with the navigation and movement of the ship.

WITH so many human lives under his care and a vessel worth three or four million pounds, the work of the captain of a mammoth liner is a task of great responsibility. He must have implicit obedience from every one else on board, including the passengers, and his word is law by day or night during the voyage. Everything must be done according to plan, the passengers must be kept pleased and comfortable, the schedule must be kept, and above all the safety of the vessel and all on board must be the first and last consideration. Not a few of the captains of our finest liners have received honours from the King, and right well have they deserved them.

Under the captain come the chief officer and his colleagues, the senior and junior officers. Each is responsible for a particular department, stowing away the cargo, the taking on board of fuel and water, the emergency stations to which each passenger and seaman must go in the event of fire or accident, the compasses, charts, signals, radio, and the navigation of the vessel. Apart from these officers the crew of a liner is divided into three sections. The deck section, the engineering section, and the purser and stewards who look to the health, feeding and comfort of the passengers.

Working a few hours at a time the turns of duty are planned out so that every member of the crew has time to sleep and rest between his or her work, and when the great vessel is at sea a routine round of jobs is completed to something like the following plan.

THE OCEAN PALACE IS A HIVE OF INDUSTRY BY NIGHT.

Soon after midnight the middle watch officers are on the bridge watching the instruments and looking out ahead ; below decks night watchmen or policemen are walking up and down the long corridors, and through the huge restaurants and saloons, just like the police of any town or city. They do not expect to find thieves, but a careful look-out must be kept for such dangers as fire. Most of the passengers are asleep after enjoying a concert, a talkie cinema show and supper. A few hours later seamen bring out long lengths of hose and wash down the decks, a duty which is done every night. Down below in the depths of the vessel the engineers adjust the oiling of the all-important bearings which will work for more than 4000 miles without stopping, firemen keep going with supplies of coal or oil to the mammoth furnaces, and not far away the baking staff are making rolls and bread for breakfast. Even printers are busy running off copies of the ship's newspaper with news supplied from the night radio engineer, who sits with headphones on his ears sending and receiving messages to the captain's orders.

All through the dark hours the ship crashes on, steadily ploughing her way through the seas. Weather reports tell the officers on the bridge what is happening ahead, and as the daylight chases away the darkness the great mass of metal, machinery and humanity still keeps steadily onwards. Relief officers come on to the bridge and take charge, relief engineers take over the work in the engine-rooms, passengers are called by stewards and stewardesses, and as they get up to breakfast the kitchens hum with the cooking of much bacon and eggs. People ask each other how they slept, and as they enjoy themselves during the morning by a turn in the specially equipped gymnasiums or swim in one of the swimming baths, or take the electric lift on to the top deck for a spell of deck quoits, deck tennis or other sports, the stewards are busy in their cabins making the beds, the kitchen staffs and waiters prepare for lunch, the engineers keep their machinery in perfect running order, and the captain begins his inspection of the whole of his domain.

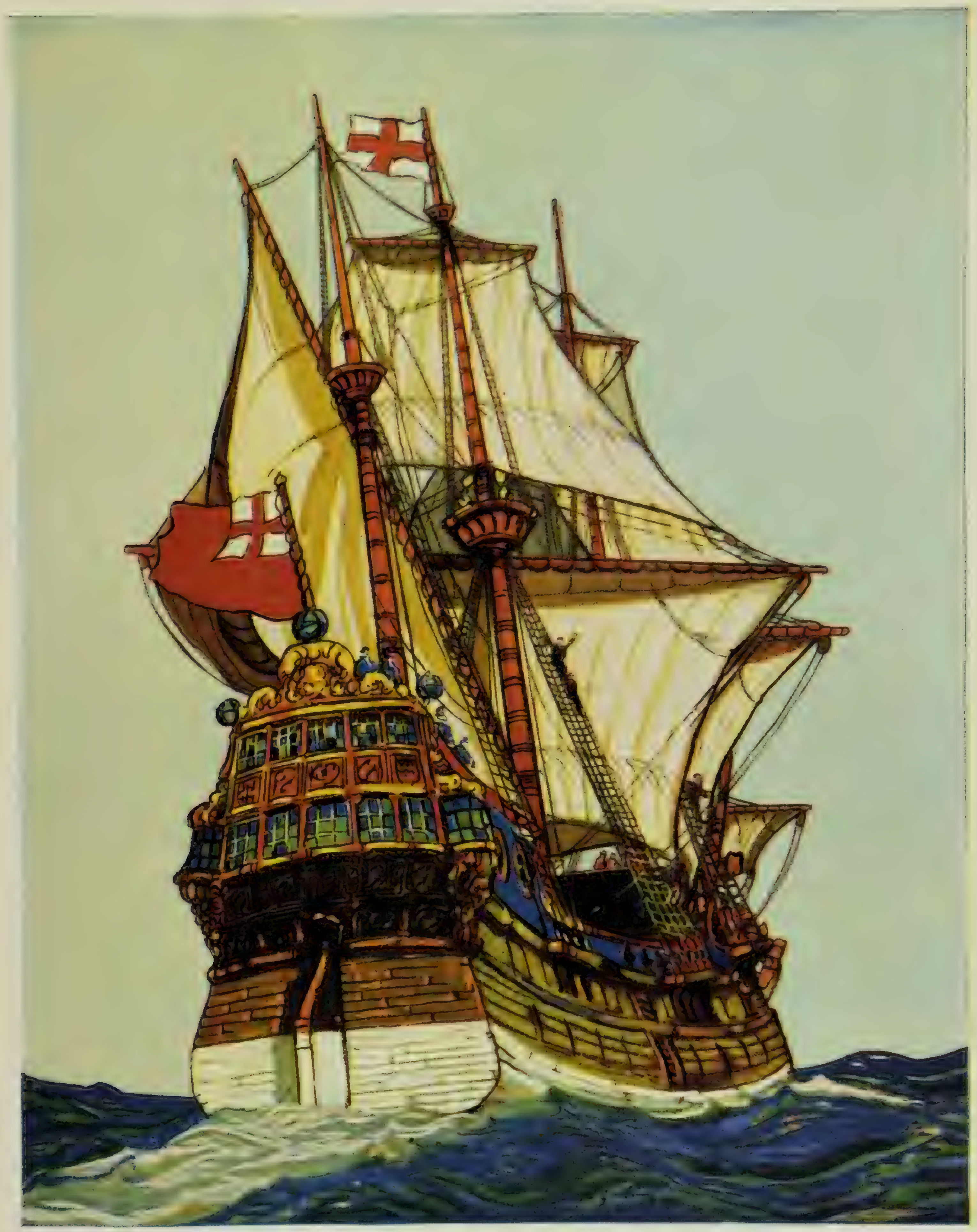
At twelve o'clock noon the vessel's siren is sounded and without slackening speed the officers on the bridge take observations to determine exactly their position. With the help of an array of instruments, and the accurate charts which are carried on board, the point reached is marked. So well is this work done nowadays that ships are brought across thousands of miles of ocean out of sight of land for several days and nights, and yet are kept on a precise course, so that at the calculated time the shadowy outline of the port is reached, and the navigators record a "good landfall," which means they have found their bearings by land just when and where they expected to find them.

Above the boiler and engine-rooms, which cover something like four or five acres of space in a great liner, there is such a vast array of rooms that it is not easy to know whether one is afloat or not. Stretching away from bow to stern the distance is 300 yards, and in the other directions the limits are 100 feet on the level, and from the keel to the upper boat-deck 90 feet. The decks are usually lettered from A to H, so that the ship is not unlike a building of eight storeys.

THE PASSENGER LINER OF TO-DAY IS THE LAST WORD IN COMFORT.

In the bedrooms of the newest liners every passenger has a bed and such items as running hot and cold water, wardrobes and electric radiators. Several rooms are arranged in the first-class sections to form a complete private flat or separate home, decorated with pictures on the walls, and even window boxes with plants and flowers over which there is, of course, a sea view. In the public halls and lounges there are smoking-rooms, writing bureaux, cafés, and all manner of comfortable places for the passengers should the weather be rough or wet.

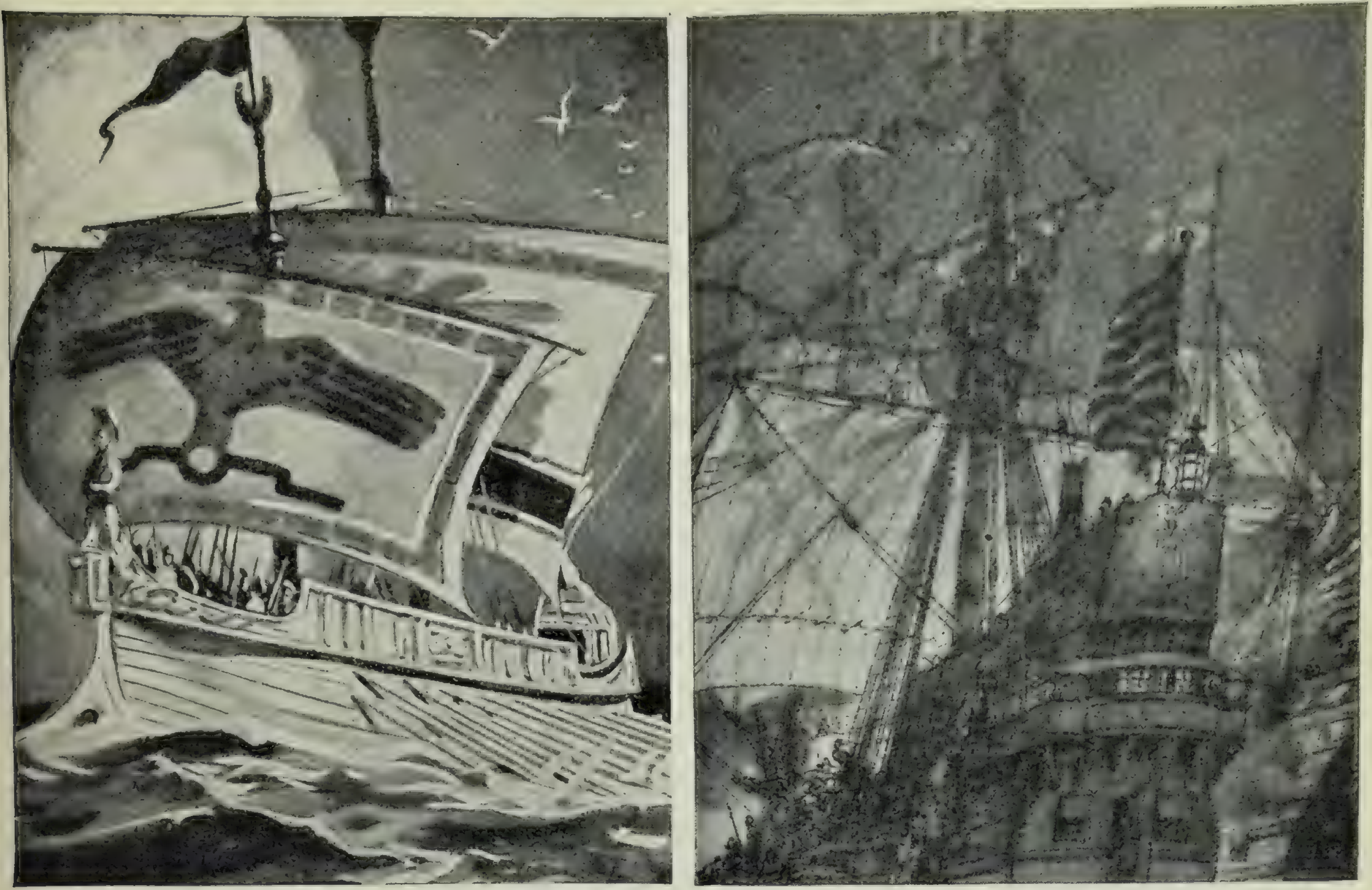
Aboard the liners, also, are the mails, and to effect the speedy delivery of letters and packets, some of the newest vessels carry small seaplanes which are catapulted off, carrying with them bags of mail and, perhaps, some passenger who is in a great hurry to reach London or New York. By this method the mails are taken direct to the cities and quickly distributed.



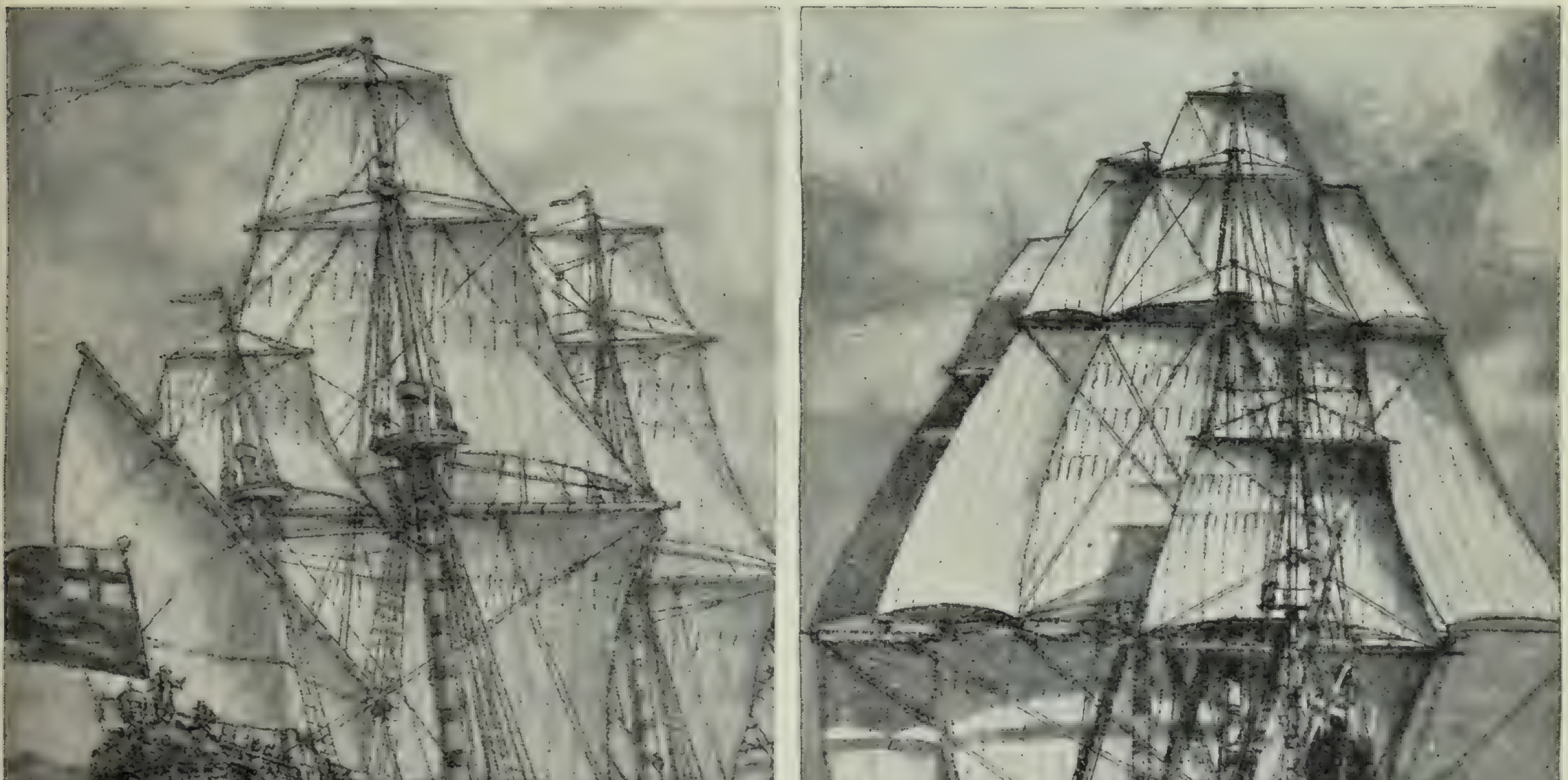
" WHITHER, O SPLENDID SHIP, AND WHAT THY QUEST ? "

A gay adventurer rides on the sunlit waves. It was in ships such as this that the hardy pioneers of Tudor times sailed the unknown seas in search of treasure and new lands. *Facing page 81*

WOODEN WALLS AND BILLOWING SAILS

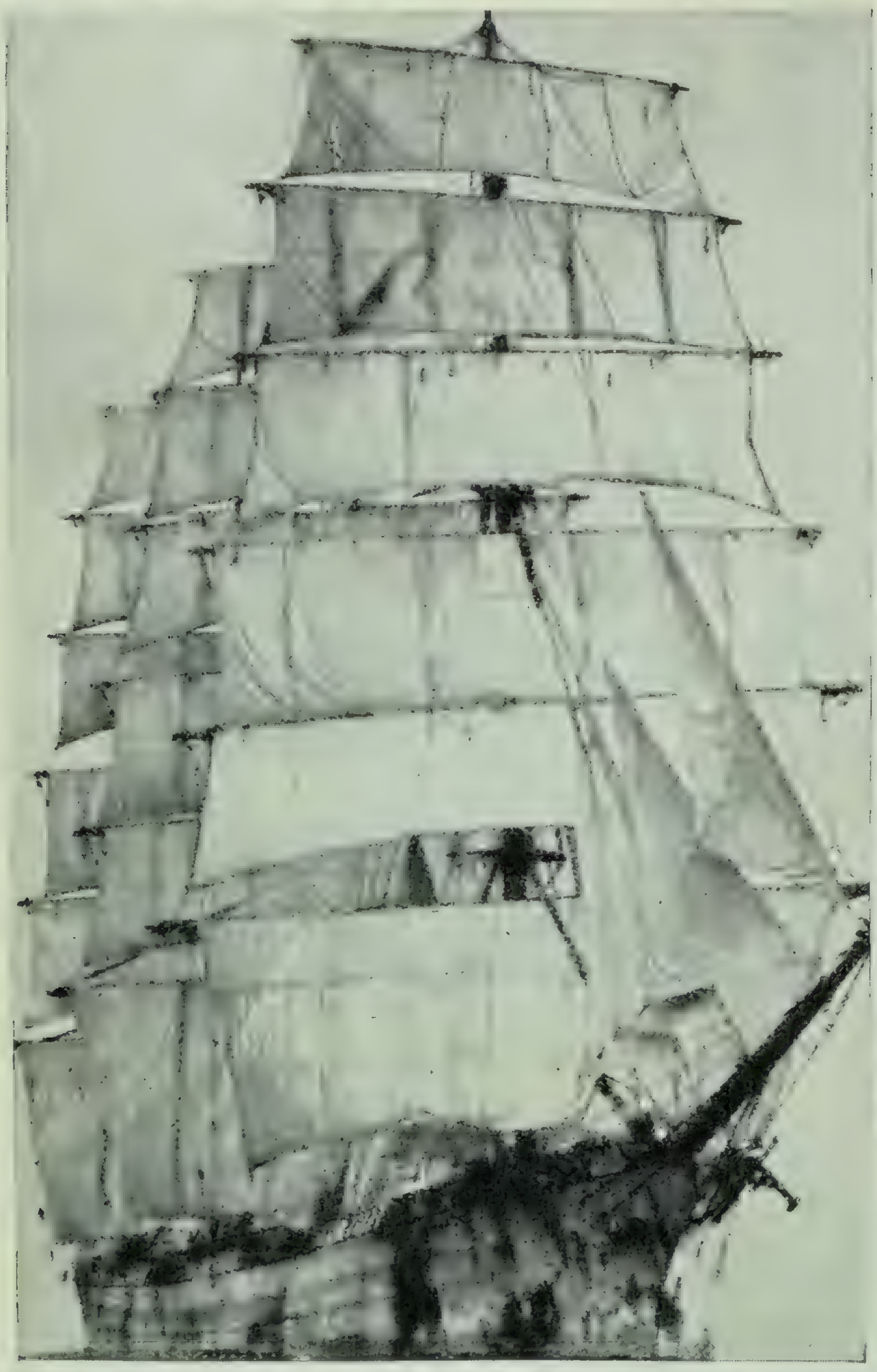


The ship on the left is a Roman vessel. It was called the bireme, as it had two banks of oars. One with three banks was a trireme. Galley slaves worked the oars. The galleon, the *Cacafuego*, was taken by Drake when he sailed round the world in the *Golden Hind*. It is one of the many Spanish "sea castles" which he captured.

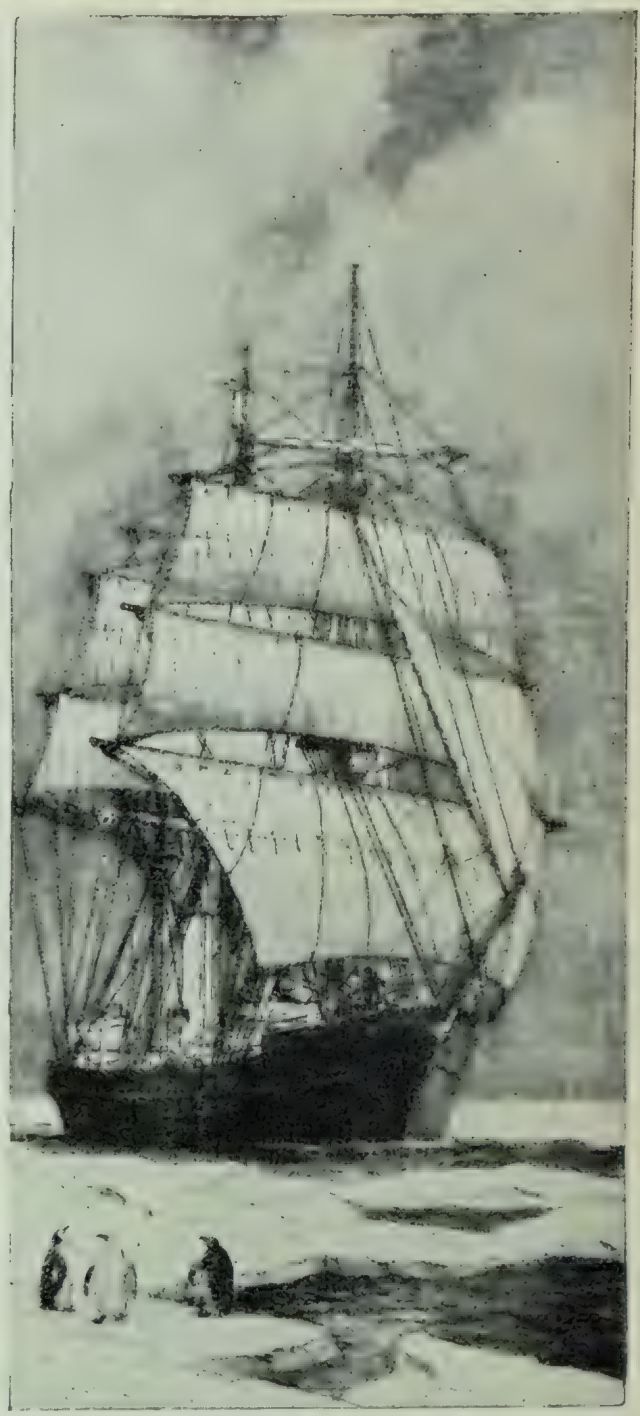


Another old ship which struggled over the unknown seas long ago is the *Roebuck*, the ship in which Dampier first surveyed the coast of New Guinea, while one of the most famous ships in history is the gallant *Resolution* in which Cook, the explorer, sailed all round the world on his wonderful voyage of discovery.

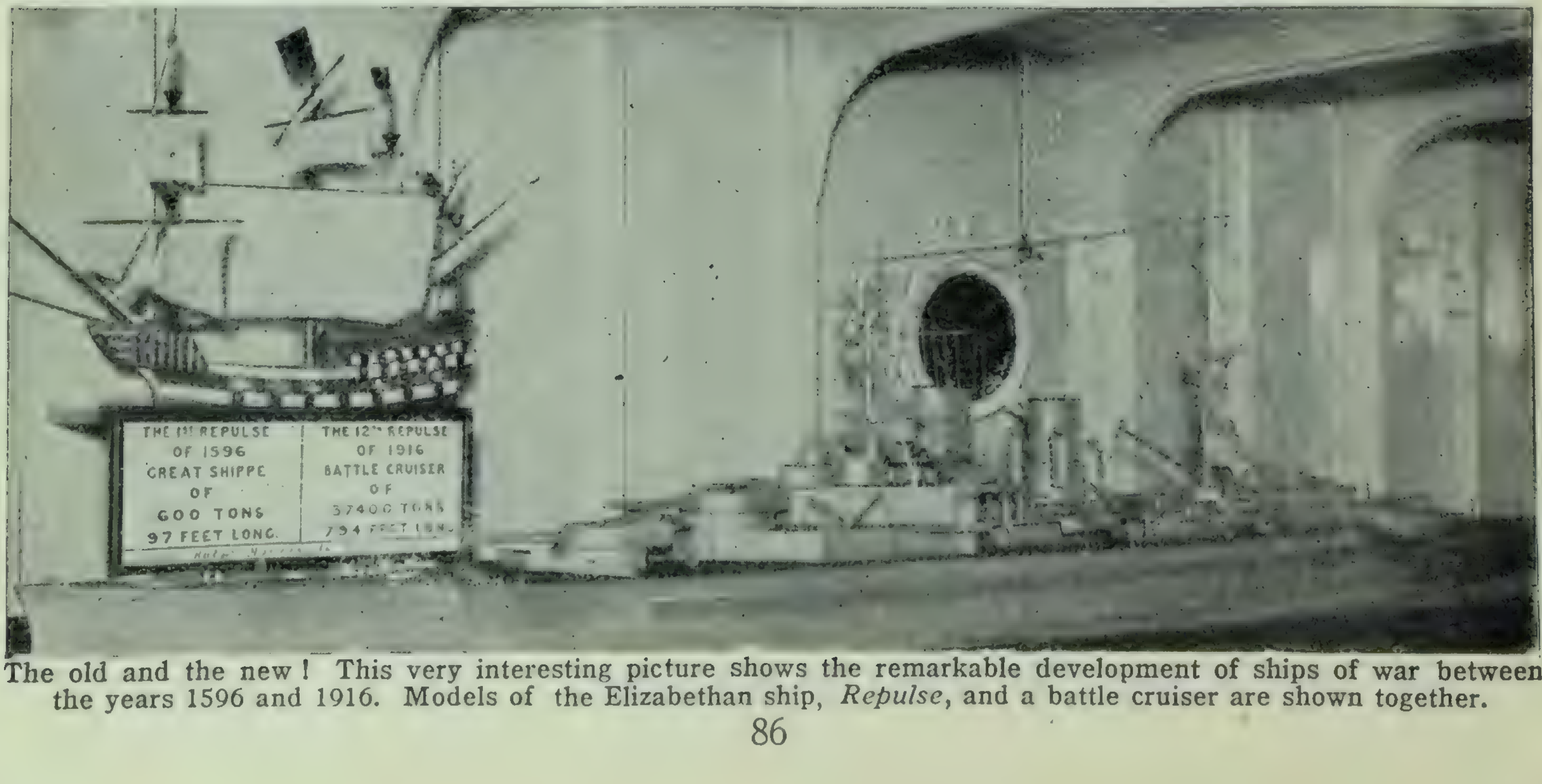
DIGNITY AND EFFICIENCY ON THE HIGH SEAS



Stately, slow-moving vessels with crowded sails moved leisurely over the seas in olden days. The *Hougomont*, so different from the ships of to-day, swept through the ocean with more grace than speed.



Scott, on his voyages of exploration, penetrated to the Antarctic, in the little *Discovery*. This journey, in such conditions, was a daring venture.

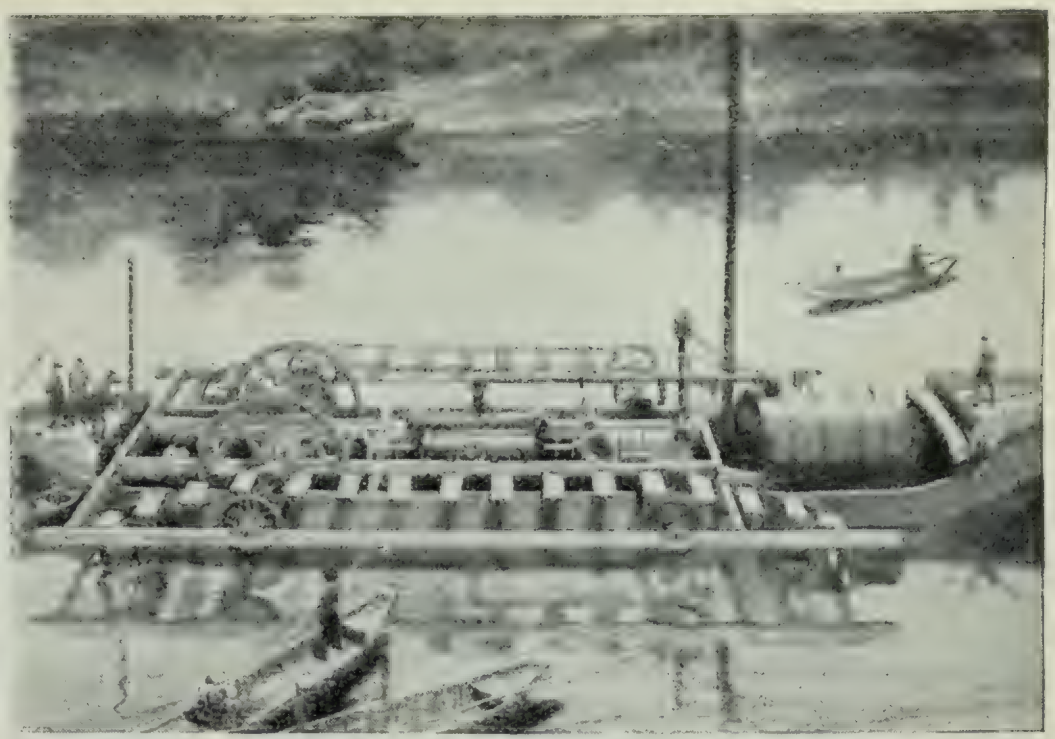


THE 1ST REPULSE
OF 1596
GREAT SHIPPE
OF
600 TONS
97 FEET LONG.
THE 12TH REPULSE
OF 1916
BATTLE CRUISER
OF
37400 TONS
794 FEET LONG

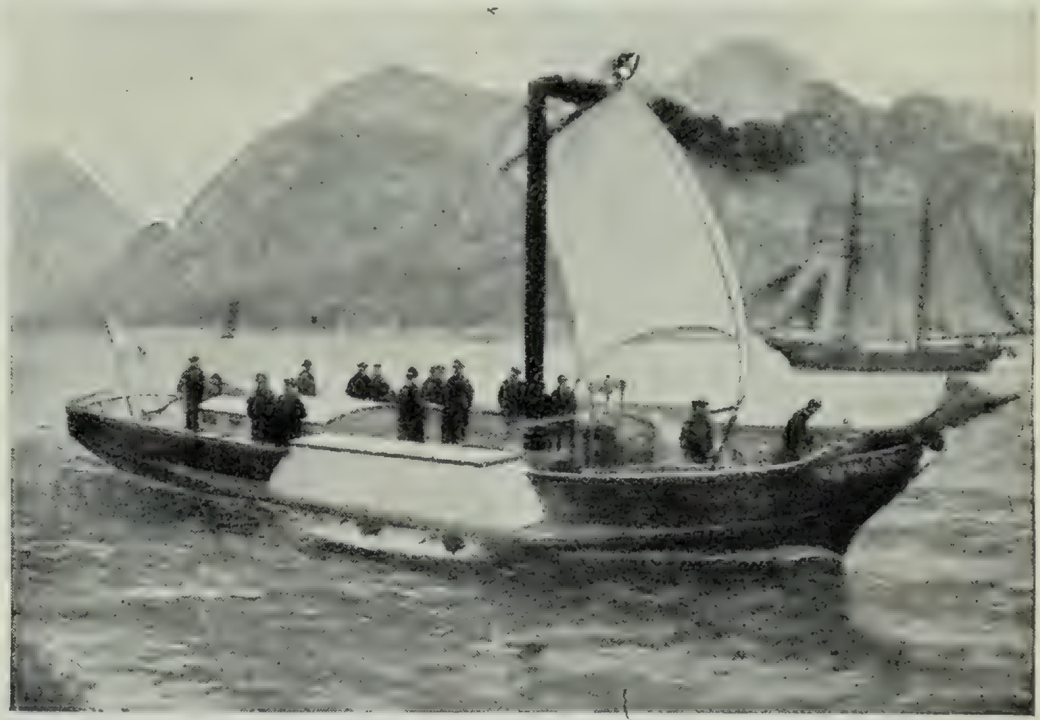
The old and the new! This very interesting picture shows the remarkable development of ships of war between the years 1596 and 1916. Models of the Elizabethan ship, *Repulse*, and a battle cruiser are shown together.

MAN'S PERSEVERANCE WITH STEAM POWER

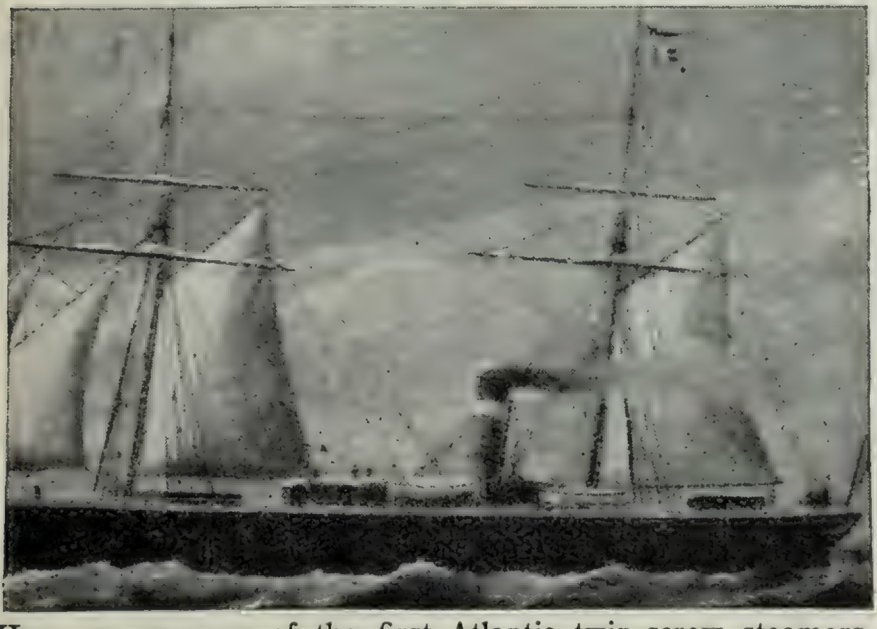
This picture shows a general view of the rigging of the four-master Danish barque, *Viking*, of Copenhagen.



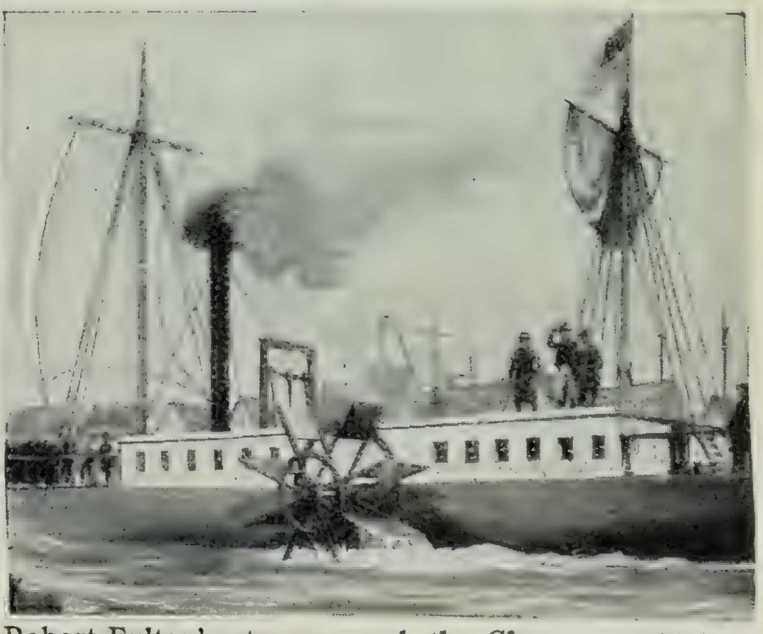
Des Blancs invented this primitive steam-boat in the year 1802. Note how crude the workings are compared to those in our modern vessels. If you look closely, you will see the curious "endless chain" paddles.



The first passenger steamship to sail on the Clyde was the famous *Comet*, built by Henry Bell in 1812. It plied, with passengers, between the towns of Glasgow, Greenock and Helensburgh.

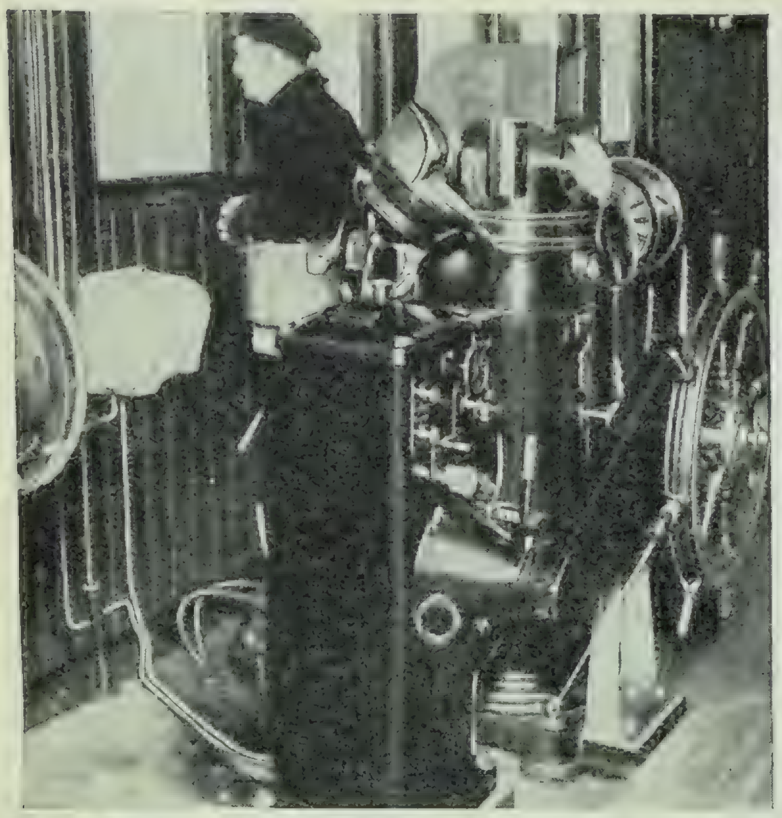


Here we see one of the first Atlantic twin-screw steamers. Most of our modern ships are of the quadruple-screw type.

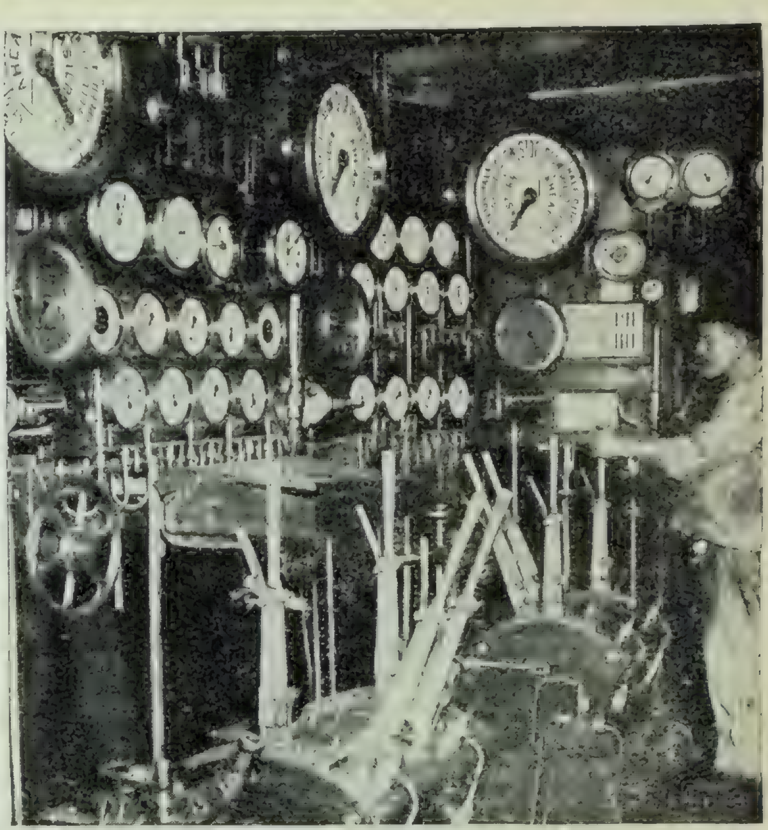


Robert Fulton's steam vessel, the *Clermont*, which on its trial trip in 1807 took 32 hours to steam 150 miles.

PEEP INTO THE WORKINGS OF A MODERN LINER



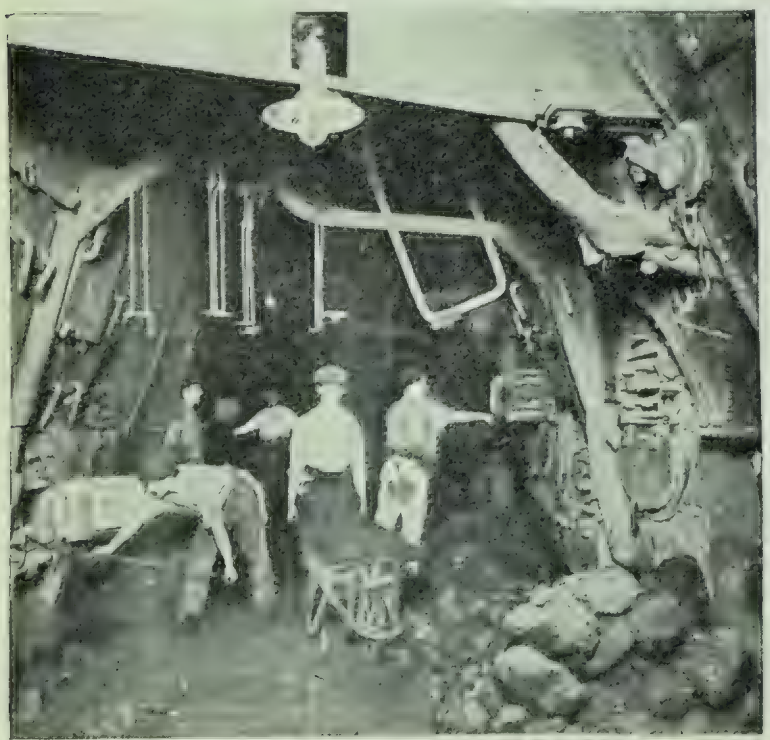
In the wheel-house of the S.S. *Laconia* are many cleverly-conceived instruments. One is the Sperry gyro pilot, which guides the ship automatically.



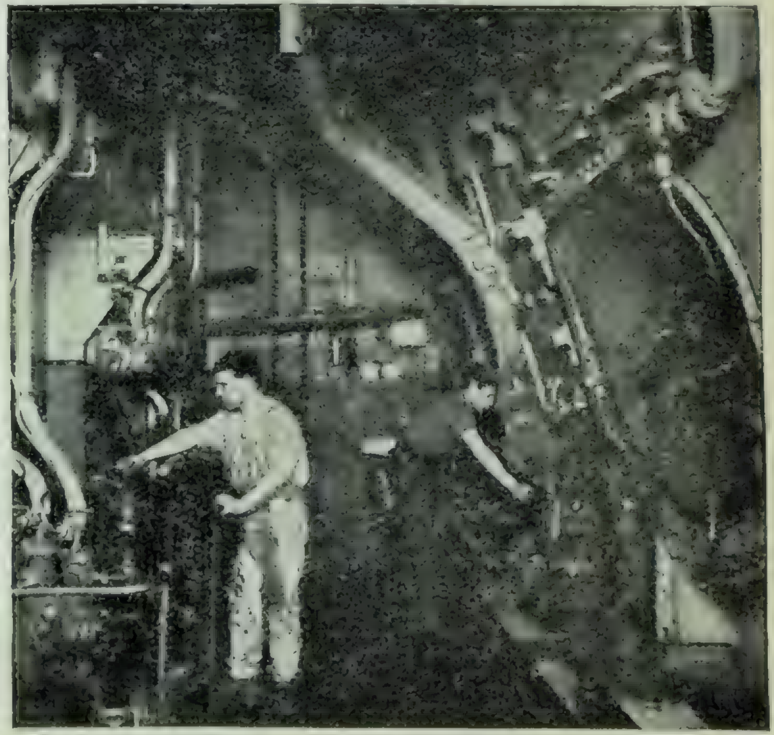
This maze of machinery is the engine-room starting platform on R.M.S. *Aquitania*. Note the many indicators which the man has to keep under observation.

The S.S. *Leviathan* is fitted up so that passengers can dine as comfortably on sea as on land. In the spacious dining-saloon meals are taken in comfort and luxury.

The chefs get busy in the kitchen on board S.S. *Republic*, cooking quite placidly while the ship ploughs its way over the ocean. The kitchens have all modern equipments.



The laborious method of stoking was used, under coaling conditions, in the *Aquitania*. The stoke-hole resembles a coal-mine. Coaling ship was a dirty business.



As a contrast to the previous picture, we see the stoke-hole of the *Aquitania*, using oil in place of coal, and therefore saving labour. Fueling ship is now an easy task.

THE COMING OF THE IRON HORSE ON RAILS

EARLY man, living amongst the forests, with flint and fire felled trees, and to move the fallen tree which was to form a dug-out canoe he used other logs. These were the earliest wheels. And in the days of the Royal Pharaohs wheeled platforms started the wheel on its many forms. Later on, flat-topped stone blocks set in parallel lines, examples of which may still be seen on some old Roman roads, helped the legions of the Empire of Rome to move their chariots along a smooth, prepared surface.

WHO REALLY WAS THE INVENTOR OF THE STEAM LOCOMOTIVE?

It was the same idea which started the use of parallel timbers to help the horses to pull heavier loads from quarries. As long ago as 1676 timber-ways were laid down to help the carrying of coal from the collieries of Durham and Northumberland to the nearest river. From these beginnings the smooth steel tracks of the fast express trains of to-day have developed.

As the timber-ways became rapidly worn, iron plates were laid over them, making them "plate-ways." Men who looked after these tracks were known as platelayers, a name which has stuck to trackmen of the trains ever since. But the wheels would not always keep to the plateways, and iron channel-ways were evolved with up-turned edges to keep the wheels on the ways. Next came cast-iron rails. William Jessop, a pupil of the famous engineer, Smeaton, invented a cast-iron rail three feet in length, and from these the long, smooth, heavy steel rails weighing ninety pounds per yard, and allowing trains to travel at ninety miles an hour in perfect safety, have developed.

Many men share the honour of inventing the steam locomotive engine. Following the use of steam for the winding engines of coal mines, the idea of making a steam engine which would propel itself along was experimented with by a Frenchman named Cugnot. This road engine worked so well that it knocked a wall down, exploded and, unfortunately, nearly killed several people. Cugnot was put into prison and his locomotive also was locked up to prevent further trouble. Later, away in Cornwall, Richard Trevithick made a successful locomotive and ran it in London, but greatly to his disgust no one seemed to be enthusiastic about his machine, and it was left to a north country coal miner's son, and to other northern engineers to persevere and bind the steam locomotive idea and the smooth railway into a wonderfully successful combination.

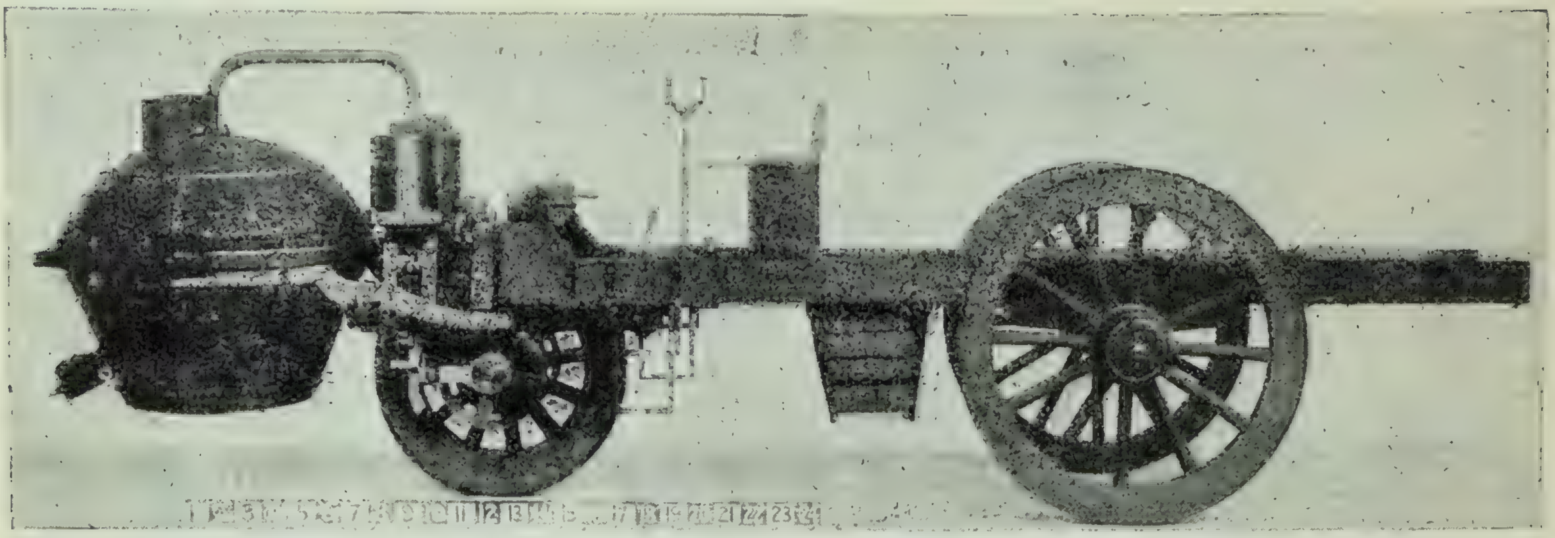
When he was a boy, George Stephenson, the coal miner's son, ran wild. Schools at that time were only for people with money, and his mother and father had neither. Their large family lived in a single downstairs room of a cottage by the River Tyne, at Wylam. It had an earthen floor, and for lads such as George the outlook was either to work on the land or down in a coal mine. George chose the land and became a herder of cattle at twopence a day. And when work failed the whole family moved elsewhere. A new seam of coal was opened underground a few miles away, and George got his first chance of seeing an engine at close quarters. He was given the job of firing the winding engine at the pit head, and by hard work earned now one shilling a day. When later he was given a colliery engineman's job he was eighteen and yet could not read or write.

Realising the great handicap of having no education, Stephenson joined an evening class run by Robin Cowens, and for threepence a week he was taught the rudiments of reading and writing. Progress was not easy, but he struggled with determination and was overjoyed when, on his nineteenth birthday, he could write his name. A kindly Scottish schoolmaster taught him mathematics, and he progressed so well under this teacher that he learned arithmetic, mensuration and geometry. By this time he could draw plans of his ideas for improving engines which he had studied at his work very deeply.

GEORGE STEPHENSON TRIUMPHS OVER ALL OBSTACLES AND WINS THROUGH.

In 1813 he completed designs for a steam locomotive, and the owners of the colliery at which he worked gave him enough money to build his first engine. Helped only by the most primitive tools such as country blacksmiths use to-day, he finished this engine after a year's work. It was a success, but still not satisfied, he went to work again and built another engine.

About this time a tramway was proposed to be made for the use of wagons pulled by horses between the coal mines in West Durham, which were rich in coal, but which were some distance from the sea coast. His inventive mind was straining and peering onward to a future of miracles undreamt of by his fellows, and he could not rest till he had manufactured a more advanced type of machine.



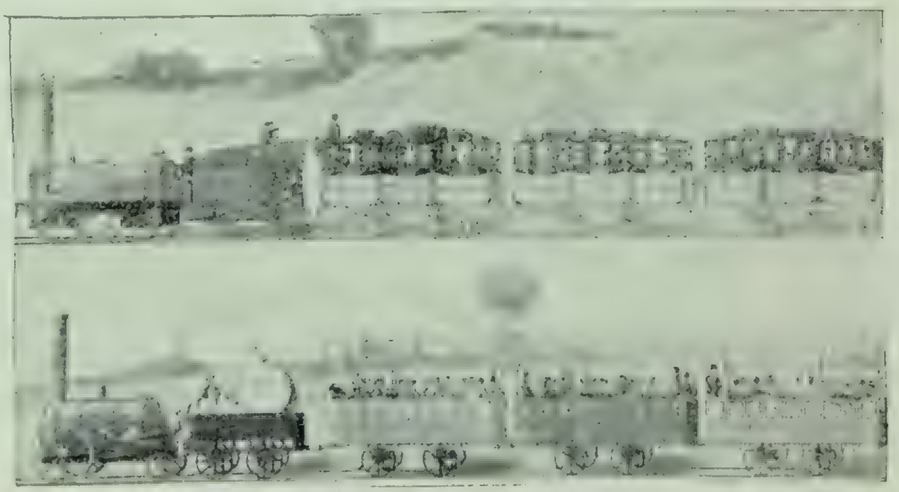
What a queer arrangement this is! Still, it was one of the first attempts at using steam to propel a carriage. Cugnot's famous steam engine actually moved, though it crashed into a wall and achieved fame by being imprisoned!

George Stephenson heard of this new scheme and went to Darlington to see Mr. Edward Pease, who was in charge of the proposal. So well did he impress Mr. Pease, and so enthusiastically did he talk of the power of his steam locomotives, that he was made chief engineer of the proposed tramway. The work of making the new way was full of difficulties, and men who up to that time had dug out canals and were known as " navvies " because they helped to construct the " navigations," had to be taught how to lay railway lines under the direction of Stephenson.

And there were few mechanics too, in those days, who could make the parts of locomotive engines, so Stephenson gave most of his savings and borrowed money to start the first locomotive factory in the world at Newcastle-upon-Tyne.

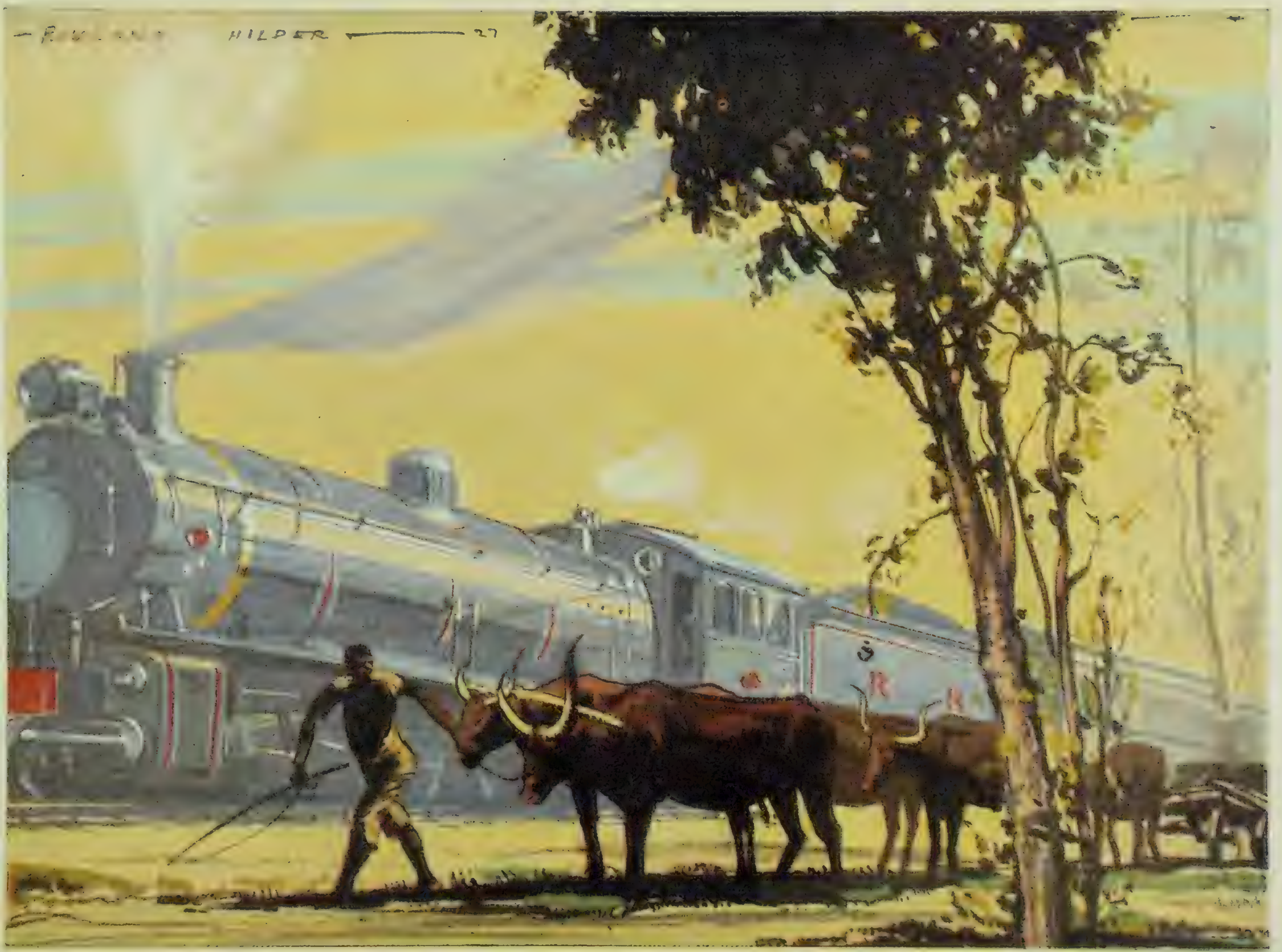
September 27, 1825, was the day decided upon for the opening of the new line. Excitement was intense, and there was little sleep for those who were to take part in the great event for the last few nights before the day. When Stephenson himself climbed up to drive his little engine, " Locomotion," built at his factory, with behind it a long train of wagons crowded with gaily dressed men and women, the crowds cheered and shouted, and excitement reached fever pitch. Nodding to the man on horseback who carried a red flag and who was to ride in front of the train, Stephenson opened the steam valve, the piston rods of the little locomotive grunted, jerked and shuddered, and wonder of wonders, the train moved off. There was a terrific burst of cheering from the dense crowd, and the first railway train in the world started on its first journey.

Four years later the directors of a new railway between Liverpool and Manchester held a competition for the best kind of locomotive, with a prize of £500 for the winner. Stephenson entered his famous " Rocket " locomotive, which was a considerable advance upon his previous engines. It romped home and easily carried off the prize by covering the test distance of thirty-five miles at the then terrific speed of twenty-nine miles an hour. Such a speed had never been heard of before. People said travellers going through the air so fast would never be able to draw breath and would die of suffocation, and other strange things. But Stephenson kept to his ideas and to his faith in the power of the steam locomotive. By dogged determination he helped forward a new era for the world—the era of speed and railways.



This is how people travelled by rail a hundred years ago. These trains ran on the Liverpool and Manchester Railway. First-class passengers had carriages like mail coaches, but second-class passengers were forced to travel in the open air. [*L.N.E.R.*

Since then a total of three-quarters of a million miles of railway tracks carry goods and passengers over many lands. Rail communications have become a vital necessity to almost every nation, and thousands of trains carrying passengers, merchandise, mails, coal and all



ANCIENT AND MODERN.

In Rhodesia methods of transport vary from the modern speedy railway-train to the lumbering oxen-cart. The latter will always be i demand, as the patient beasts of burden can penetrate over the rough tracks where the iron horse cannot make its way. Thus, as in th picture, the old and the new are often seen side by side.

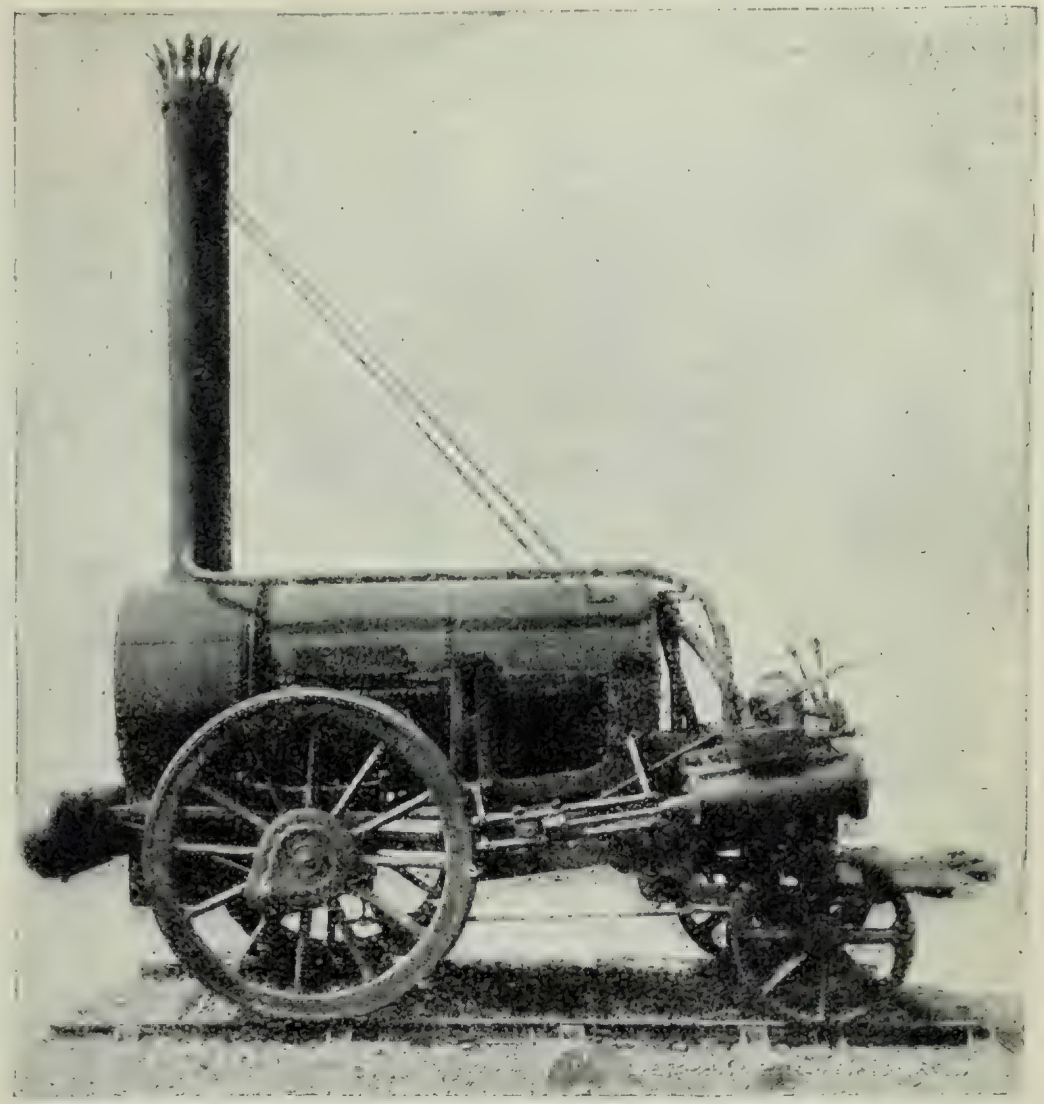
[*Reproduced by courtesy of the Rhodesia Railways, Ltd., from the painting by Rowland Hild*

Facing page 91

manner of goods at express and slow speeds are constantly thundering across the countries of the world by night and day, a ceaseless service for humanity.

In this country we have cause to be proud of our trains, for just as we gave the idea of engines and railways to the world, we still hold the blue ribbon records for speed, endurance and safety.

The fastest train in the world is the "Cheltenham Flier" express which covers the 77.3 miles from Swindon to London in 67 minutes, an average speed of 69.16 miles an hour. On one occasion this schedule was well and truly beaten, a new world record run being made. On this trip the 77.3 miles were covered in 56 minutes 47 seconds, the average speed being no less than 81.68 miles an hour. The top speed touched was 92 miles an hour, and no less than a mile a minute was reached within two minutes of the start.

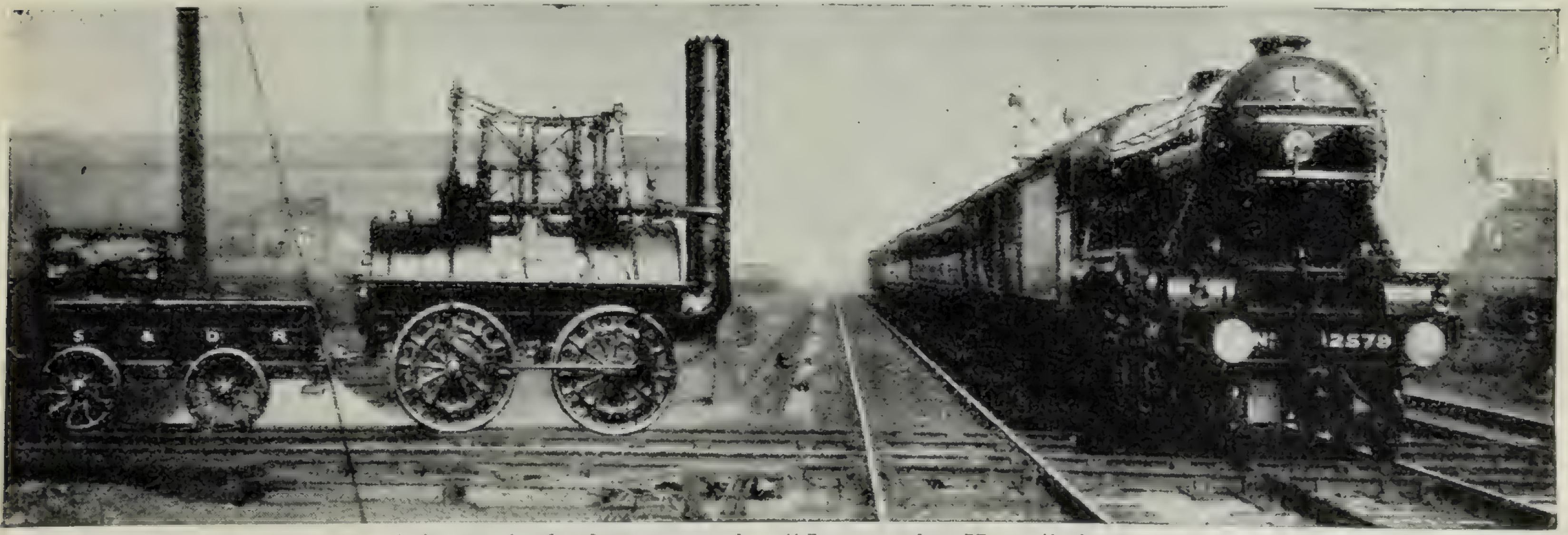


The famous "Rocket," built by George Stephenson, won a prize of £500 a hundred years ago, and pulled a heavy load at a steady speed of nearly thirty miles per hour. Its success, in spite of adverse criticism, led to the adoption of railway transport for passengers and goods.

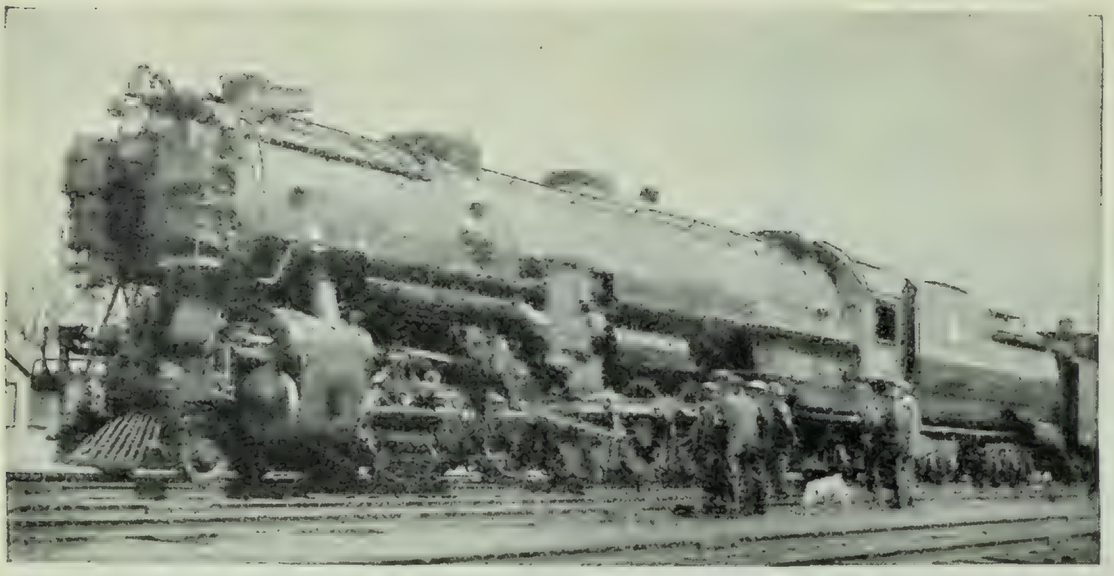
The record of express railway trains for the highest average speed over the longest possible distance, or the world's longest non-stop run, has been put up and held by the two "Flying Scotsman" day express trains, which every week-day in the summer cover the complete distance between London and Edinburgh—392¼ miles—in 7½ hours, an average speed of 52.3 miles an hour. With wheels turning and mechanism moving for seven and a half hours at speeds varying from eighteen to eighty miles an hour these trains are certainly unique.

The pacific type engines used are fitted with corridors through their coal tenders, along which relief enginemen walk from the trains to the footplates after half the journeys have been completed, as the strain of driving and firing for two hundred miles is thought to be enough for any engine driver or fireman.

But whilst this country holds all the records for train running, the penalty of having been the first to develop railways has affected the size of the locomotives which can be used. The limits of possible height and width for British



The old and the new. On the left stands the famous engine "Locomotion No. 1," the first locomotive made for a public railway. It ran its first journey in 1825. On the right, cutting across the veteran's tracks, is the "Flying Scotsman."



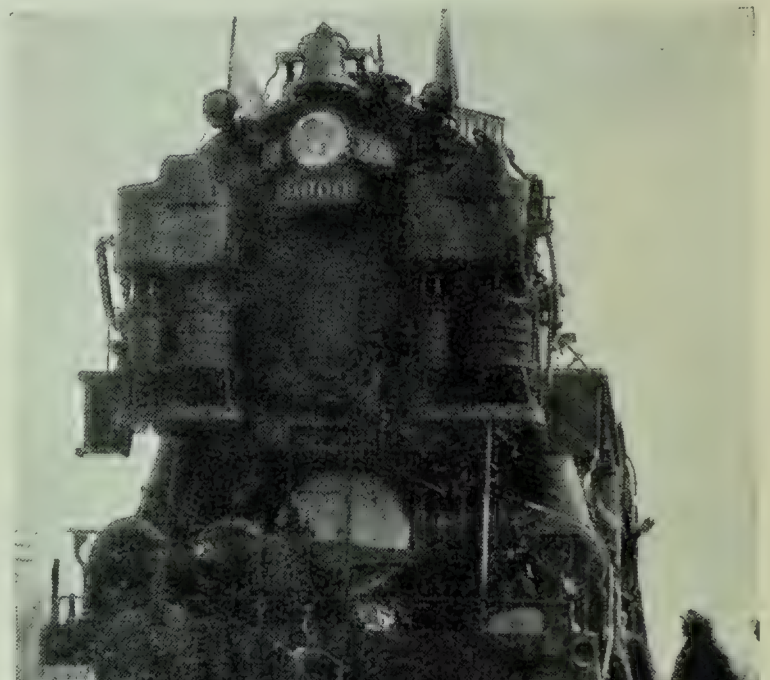
The locomotives of America have long journeys of almost a week in duration. For such strenuous journeys great power is needed. Here is the new 4-12-2 Union Pacific freight locomotive. Its immense length and height may be understood by comparing the locomotive with the men who stand by its side. [*Railway Mag.*

railway engines has long been reached, and whilst the railways of this country have done especially well with their small engines, the locomotives of other lands are vastly bigger and more powerful. In America, for example, a single engine has been built which is able to pull a train weighing 3000 tons. Provided with a twelve-wheeled tender, this mammoth locomotive carries with it as fuel some 13,500 gallons of water and twenty tons of coal.

But every locomotive on the railways is built for a particular job, and it would be wasteful and unnecessary to build huge engines where smaller ones will do the work equally well. In the great family of railway locomotives, therefore, there are all manner of types and classes of engines, from the smallest shunting tank type locomotive to the heaviest and largest express passenger or heavy freight.

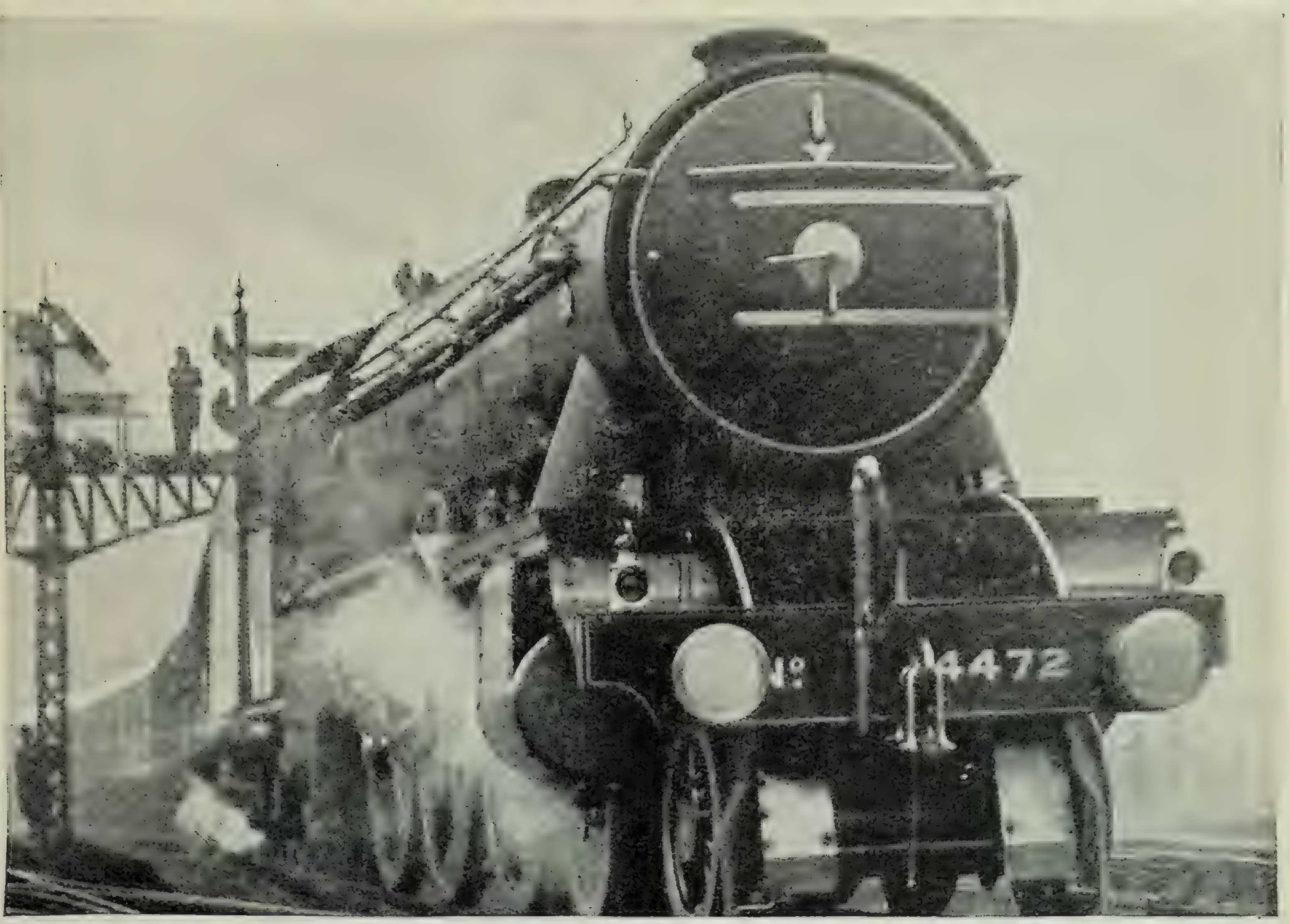
One of the most remarkable express engines in the world is the strange-looking four-cylinder compound locomotive, No. 10,000, built for the " Flying Scotsman " expresses. This engine is hooded and stream-lined to throw the smoke and steam clear of the driver's look-out windows, and although it carries 5000 gallons of water and nine tons of coal, the object of its construction was to run on less fuel than other types of engines. The boiler and controls in this locomotive are similar to those used on a torpedo boat destroyer of the navy, and the experiments which are being made with it will be of great help in building locomotives for the railways in the future, which may be patterned on this strange-looking machine.

Apart from railway engines, carriages and trucks, some miracles of modern engineering have been achieved by men who have made the permanent ways along which the trains may run, and passengers may travel in comfort and security. To span the Firth of Forth, in Scotland, one and a half miles across, the gigantic Forth Bridge was built at a cost of three and a half million pounds. Until the erection of the Quebec Bridge across the St. Lawrence River, in Canada—another wonderful structure—it had the three largest cantilever spans in the world, each stretching 1710 feet. These are but two of the wonder bridges which have been built to carry the rails across valleys, arms of the sea and rivers. Another marvellous bridge was the railway viaduct made just below the Victoria Falls across the Zambezi River. This structure was actually built first at Darlington in England, quietly taken apart, each section being numbered and lettered. The whole bridge was securely packed and sent out by ship to Africa where it was transported to the Zambezi in



Here is a front view of the same engine. Note its towering height and the cowcatcher sweeping the rails before it. The numbers 4-12-2 mean the arrangement of its wheels. The first and last numbers refer to the bogey or supporting wheels, the centre figure to the number of those that drive the engine. [*Railway Magazine.*

MECHANICAL MONARCHS OF THE IRON WAY



The giant "Flying Scotsman" sets out on his morning stroll! Here he is, full of throbbing power, rattling out of the station to begin his journey to Edinburgh. This is the longest non-stop run in the world. [*L.N.E.R.*

The "Flying Scotsman" says how-d'you-do to his brother by giving a piercing whistle before dashing past him on the vast iron road between London and Edinburgh. This daily greeting of the two giant expresses, which takes place near Alne Station, shows us the marvel of railway timing. [*L.N.E.R.*

pieces. Engineers put it together on the place where it was wanted, and by careful and accurate reckoning the whole thing fitted exactly.

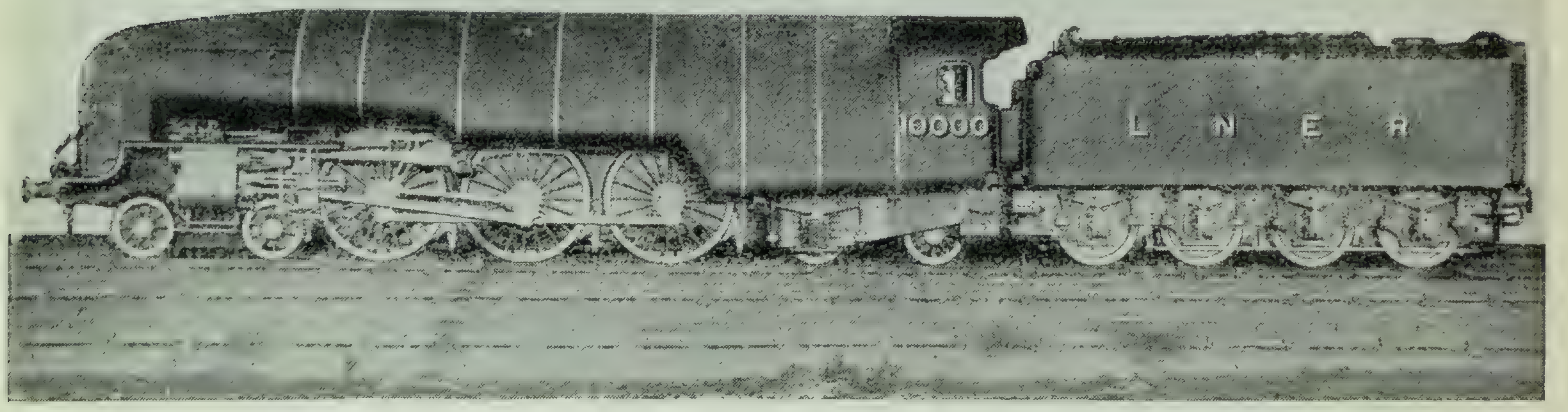
ACROSS in Norway and in the Andes of South America there are two other miracles of engineering, in the shape of railways which reach up amongst the eternal snows. By the constant use of snow-ploughs all the year round the metals are kept clear, so that dining and sleeping cars may carry travellers through to their destinations in spite of the wildest possible weather, snowstorms, blizzards and the grim gaunt mountains amongst which these routes lie.

HOW WE CAN TRAVEL THROUGH THE HEART OF A MOUNTAIN.

And, again, below the surface of the earth engineers have bored tunnels through the solid granite of some of the greatest mountains on the earth. The wonderful Simplon Tunnels which connect Switzerland with Italy and pass through the Alps, are a monument of the wizardry of the rail engineer. Commencing at both sides of a range of mountains at the same time, these tunnels met in the middle according to plan, and there is now a clear way through for express trains by day or night.

The "Age of Steam" which began well over a century ago brought forth the railway locomotive engine and the steamship, but it is well worth remembering that the earliest steam locomotives ran on the roads. When the railways began to be popular many inventors tried to develop steam road coaches, and during this time much pioneer work was done towards finding other means of producing power than by steam. This pioneer work was of very great value as it led to gas engines and later to the petrol engines which are used on motor cars to-day.

In the steam engine there are three distinct parts, the furnace, the boiler and steam pipes, and the piston and valves or motion. Coal is burnt in the furnace, water is turned to steam in the boiler, and the motion parts are set going by the expansive power of steam. But in the case of gas and petrol engines, early investigators were convinced that power and movement could be obtained by the direct combustion of a fuel inside the working cylinder of an engine instead of using the fuel indirectly, first to make water into steam in a boiler and then to lead it to the motion. The main problem was what kind of fuel would burn inside an engine cylinder? There is probably one substance which will immediately suggest itself—gunpowder! And amongst the records of the inventors there is little doubt that this substance was tried with what was known as an explosion engine. Needless to say it did not get beyond the experimental stage. Other men thought of other substances such as turpentine and hydrogen gas, and considerable success was achieved in this direction. The cheapness with which coal could be obtained, however, and the rapidity with which it boiled water into steam, made other methods appear expensive in comparison.



Here is the famous "Hush, Hush" engine known as "The 10,000," built for great power and speed by the L.N.E. Railway. Note the peculiar shape of the body, so designed to offer least resistance to the wind. [*L.N.E.R.*

GAS FROM COAL NOW MADE TO YIELD UP ITS POWER.

For fifty years the steam engine for railway locomotives, ships, and stationary engine purposes was the best the world could think of, but with the coming of the introduction of gas for lighting, the explosive experimentors took new heart. Gas was given off from coal when it was burnt, and this valuable by-product when collected was very suitable not only for lighting, but also to work an engine, and the

Lenior Gas Engine, produced in 1860, proved that motive power could be made in a more compact and convenient way by explosions than by steam engines. One great difficulty was that the gas had constantly to be supplied to this engine and it could not, therefore, be used to propel a carriage along either a roadway or a railway. As a stationary power machine it was a great success, but a store of gas could not very well be carried in a compressed form without danger, and the inventors were almost beaten.

ONCE EVERY MOTOR CAR HAD TO HAVE A MAN WALKING BEFORE IT WITH A RED FLAG.

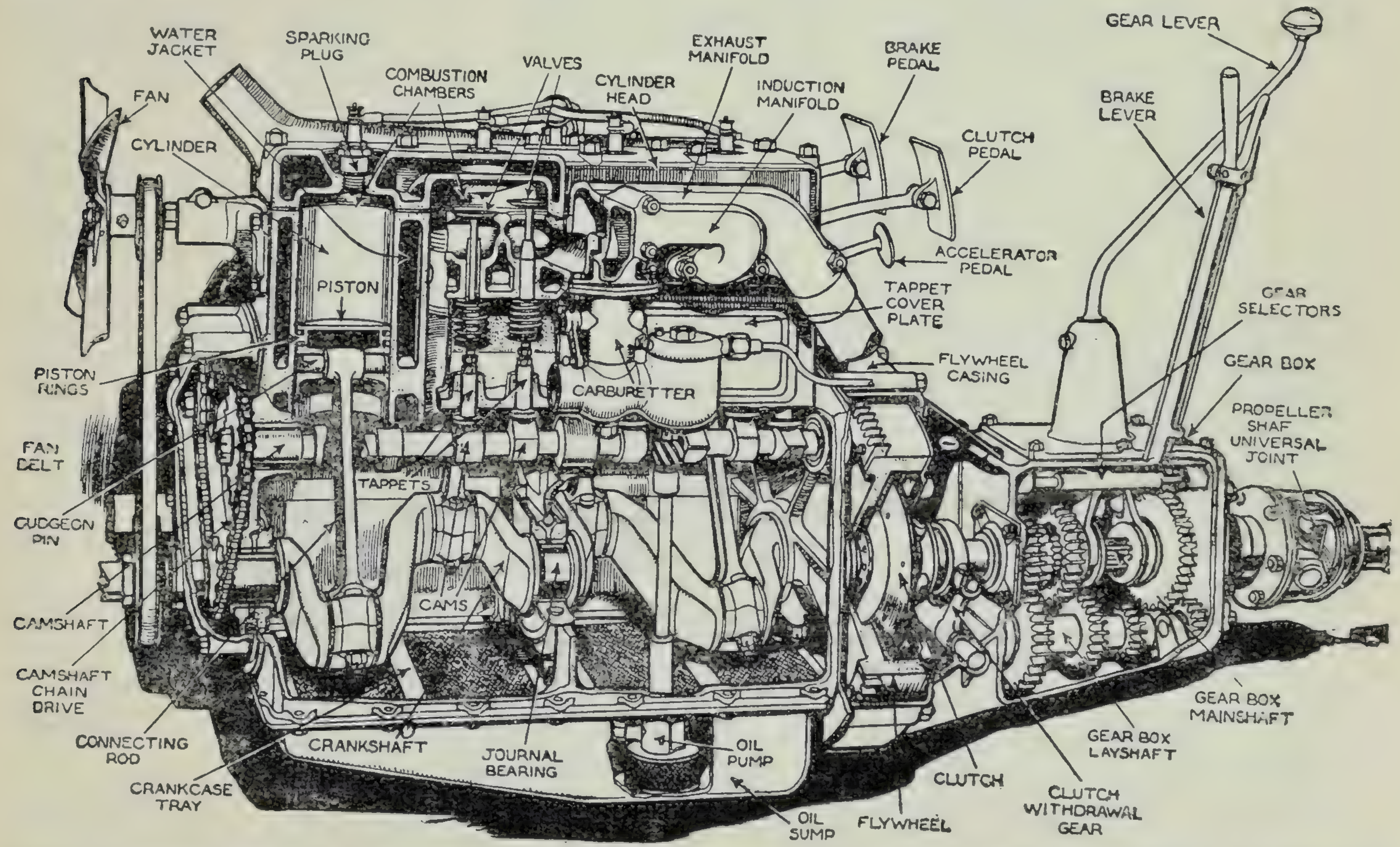
There is no doubt, however, that the experience obtained with gas engines helped greatly to develop the petrol engine. The theory was advanced, that if a gas would drive a large flywheel so effectively, a liquid such as benzine or refined petroleum could be easily converted into a gas just when it was wanted if properly mixed with the air. Smaller, lighter and faster working engines, it was said, could be made to run with such liquid fuel which could also be carried about in tanks.

The engineers and inventors—Benz, Daimler, De Dion and Panhard—tried out petrol engines to move road carriages along. Gottlieb Daimler with his colleague, Otto, invented a gas engine, in 1886 fitted a petrol engine to a cycle, and a year later tried out a similar engine to a car. Waves of enthusiasm carried the development of the petrol engine forward for ten years, and in 1900 the manufacture of motor cars was well under way. About this time a law which was passed in Britain some years before proved to be very awkward for the first motor car users. This law said that any carriages which ran along the public roads without a horse should limit their speed to two miles an hour, and required them to be preceded by a man with a red flag.

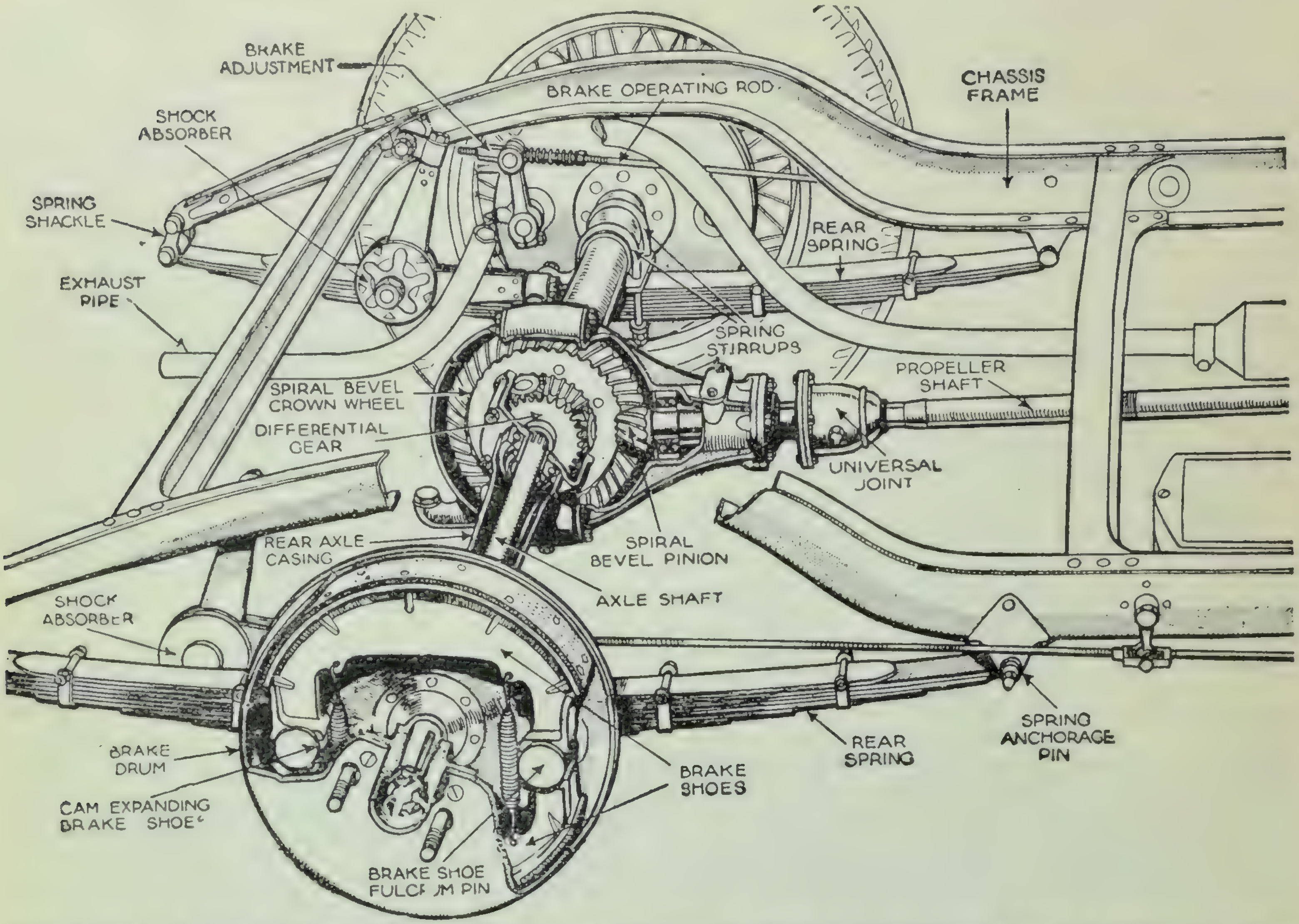
The law was at last repealed, and since that time a commemoration run of the oldest cars which can still work has been held since 1896 from London to Brighton, known as the "Old Crocks'" run. One of the oldest cars in this run is a Daimler which headed the procession in 1932. This "crock" dates back to 1894 —thirty-eight years ago—it has been in use ever since that year, and for the first two years of its career it was only allowed to run at two miles an hour with a flagman preceding it. Rapid progress has been made since then, and those old types of cars—the pioneers of the road—are looked on as curiosities to-day.

PETROL IS NOW TRULY THE "SPIRIT" OF AIR, LAND AND SEA TRAVEL.

This is how the petrol engine was born. But it would not be right to think that petrol


WATER JACKET
SPARKING PLUG
COMBUSTION CHAMBERS
VALVES
CYLINDER HEAD
EXHAUST MANIFOLD
INDUCTION MANIFOLD
BRAKE PEDAL
GEAR LEVER
BRAKE LEVER
CLUTCH PEDAL
FAN
CYLINDER
ACCELERATOR PEDAL
PISTON
TAPPET COVER PLATE
GEAR SELECTORS
FLYWHEEL CASING
GEAR BOX
PISTON RINGS
CARBURETTER
PROPELLER SHAFT UNIVERSAL JOINT
FAN BELT
TAPPETS
GUDGEON PIN
CAMS
CAMSHAFT
CAMSHAFT CHAIN DRIVE
GEAR BOX MAINSHAFT
CONNECTING ROD
CRANKSHAFT
JOURNAL BEARING
OIL PUMP
GEAR BOX LAYSHAFT
CLUTCH
CLUTCH WITHDRAWAL GEAR
CRANKCASE TRAY
OIL SUMP
FLYWHEEL

Here is a diagram showing the engine of a four-cylinder motor car. It seems to be an intricate piece of mechanism, does it not? Yet every part fits accurately and works smoothly. Note the gear-box on the right of the picture.


BRAKE ADJUSTMENT
BRAKE OPERATING ROD
CHASSIS FRAME
SHOCK ABSORBER
SPRING SHACKLE
REAR SPRING
EXHAUST PIPE
SPRING STIRRUPS
PROPELLER SHAFT
SPIRAL BEVEL CROWN WHEEL
DIFFERENTIAL GEAR
UNIVERSAL JOINT
REAR AXLE CASING
SPIRAL BEVEL PINION
AXLE SHAFT
SHOCK ABSORBER
SPRING ANCHORAGE PIN
BRAKE DRUM
REAR SPRING
BRAKE SHOES
CAM EXPANDING BRAKE SHOE
BRAKE SHOE FULCRUM PIN

Here is the back axle of the car, whose engine you saw on page 95. Note how the driving power, brought to the rear axle by the propeller shaft, is transferred to the wheels by means of the crown wheel and differential gear.

engines are used solely for motor cars. Airships soon took up this form of power, aeroplanes, motor boats, speed boats, farm tractors, and even electric lighting outfits use the compact and light petrol engine which works upon the " internal combustion " principle.

The first practical types of petrol engines were what is known as single-cylinder engines of simple arrangement. This type is still used for motor cycles and fixed machinery, but for motor cars, four and six-cylinder engines are most widely used. Eight and twelve-cylinder engines are adopted, though only to a limited extent, and what are known as radial and rotary engines are used for aircraft.

HOW DOES PETROL MAKE AN INTERNAL COMBUSTION ENGINE GO?

In every cylinder of a petrol engine there is a piston which just fits, like a bullet in a gun. Explosive petrol vapour, a mixture of petrol and air, is drawn into the closed top of the cylinder, compressed by the piston which is pushed upwards by a hinged arm called a connecting rod, like a ram-rod in a gun, and at the instant at which it is most compressed a sparking plug explodes the hemmed-in gas by an electric spark which is supplied at precisely the correct time it is needed to shoot downwards the little piston, moving also the connecting rod which in turn pushes or thrusts a crank and causes a shaft on which there is a fly-wheel to move around. The burnt gas must be got rid of, and as the fly-wheel moves, its momentum sends the connecting rod and the piston at the top of it back up the cylinder again to push out the exhaust fumes. Still the work of the fly-wheel is not finished, a fresh supply of petrol vapour is needed for the next explosion, and this is obtained as the piston is again drawn out by the momentum of the fly-wheel. Thus there are four different strokes inside every petrol engine cylinder. First the suction stroke which draws into the top of the cylinder the explosive mixture, next the compression stroke which packs the gas as tight as possible, thirdly, the firing stroke which gives the actual power, and, lastly, the exhaust stroke which clears away the spent gases.

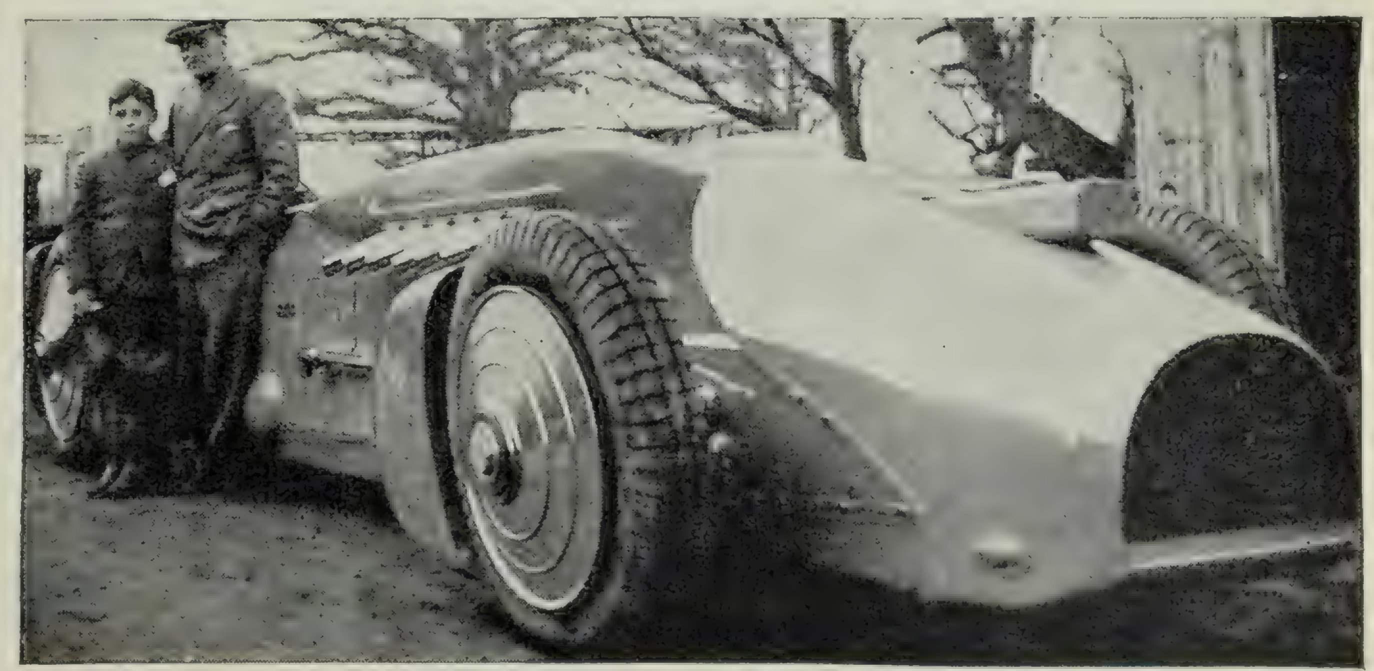
WHAT ARE THE TWO METHODS OF STARTING UP A MOTOR ENGINE?

In a four-cylinder engine the pistons are arranged so that they fire at different instants and keep firing, so that instead of one or two loud explosions there is merely a gentle purring

Sir Malcolm Campbell holds the world's land speed record.

sound which gives off a higher note as the engine is speeded up. Every petrol engine must be helped to start up, and whereas this used to be done by a handle in the front of a motor car, it is now general for a small electric motor to be pressed into service by merely touching a starting button.

Since the petrol engine was found to be an excellent form of power for road cars, a large number of very helpful refinements have been made, such as braking devices to bring a car to a stop, gears which allow cars to travel at different speeds and also permit quite small engines to drive comparatively large cars. By running a petrol engine with its fly-wheel quite freely and rapidly, heavy cars can be started easily, and when they are set going along fairly level stretches of road, the engine can be slowed down and yet the same speed or a faster rate of speed is obtained. This is accomplished by ingenious gearing cogs.


Sir Malcolm Campbell and his son standing by the new wonder car, "Blue Bird."

Indeed, so efficient and excellent have petrol engines become that motor cars have been driven thousands of miles over land surfaces, through uninhabited spaces, across deserts, and amongst swamps and jungles. By splendid workmanship and clever calculations the exact precision necessary to make motor engines put out the greatest amount of power at all times has been accomplished, and more and more people are realising how they may depend upon motor cars and road motors of all descriptions to transport them wherever they wish to go.

TERRIFYING SPEEDS ARE POSSIBLE IN MODERN RACING CARS.

Private motoring, like private flying, has become a widespread business in many countries, and the owners of motor cars are proving that a citizen may, under certain conditions, be mobile, that is, he may with a motor car move himself about whenever he wishes, and at the same time may spend several hours of the day doing his ordinary work. Needing no transport service, the private motorist is a new factor in civilisation.

High speed records have been made by motorists who have been equipped with specially constructed racing cars, built just to see how fast a man can travel along the earth's land surface. The fastest speed ever reached with a motor car was attained on February 22, 1933, by Sir Malcolm Campbell. At Daytona Beach, America, he took out his new "Blue Bird" in the hope of breaking the record he set up in February 1932, at a staggering speed of 253.968 miles per hour. His car was equipped with a Rolls-Royce Schneider Trophy type engine developing nearly 2,500 horse power, and lead weights had to be introduced under the driving seats to hold down the car, or at four miles a minute it would probably have left the ground altogether.

On Wednesday, February 22, 1933, Sir Malcolm took his car on to the beach. He had just had influenza, his left arm was sprained, the beach was not in good condition, and there was a haze. Undaunted he pointed his monster for the measured mile, and with one hand drove this car—the eleventh time he has steered it for record purposes—at an average speed of 272.108 miles per hour between the timing machines. The speed on his first run of the test was 273.556 miles per hour.

The Indian cheetah or leopard is said to be the fastest creature on legs, and speeds of a mile a minute have been observed, but in a race with Sir Malcolm's "Blue Bird" a cheetah would soon be left behind.

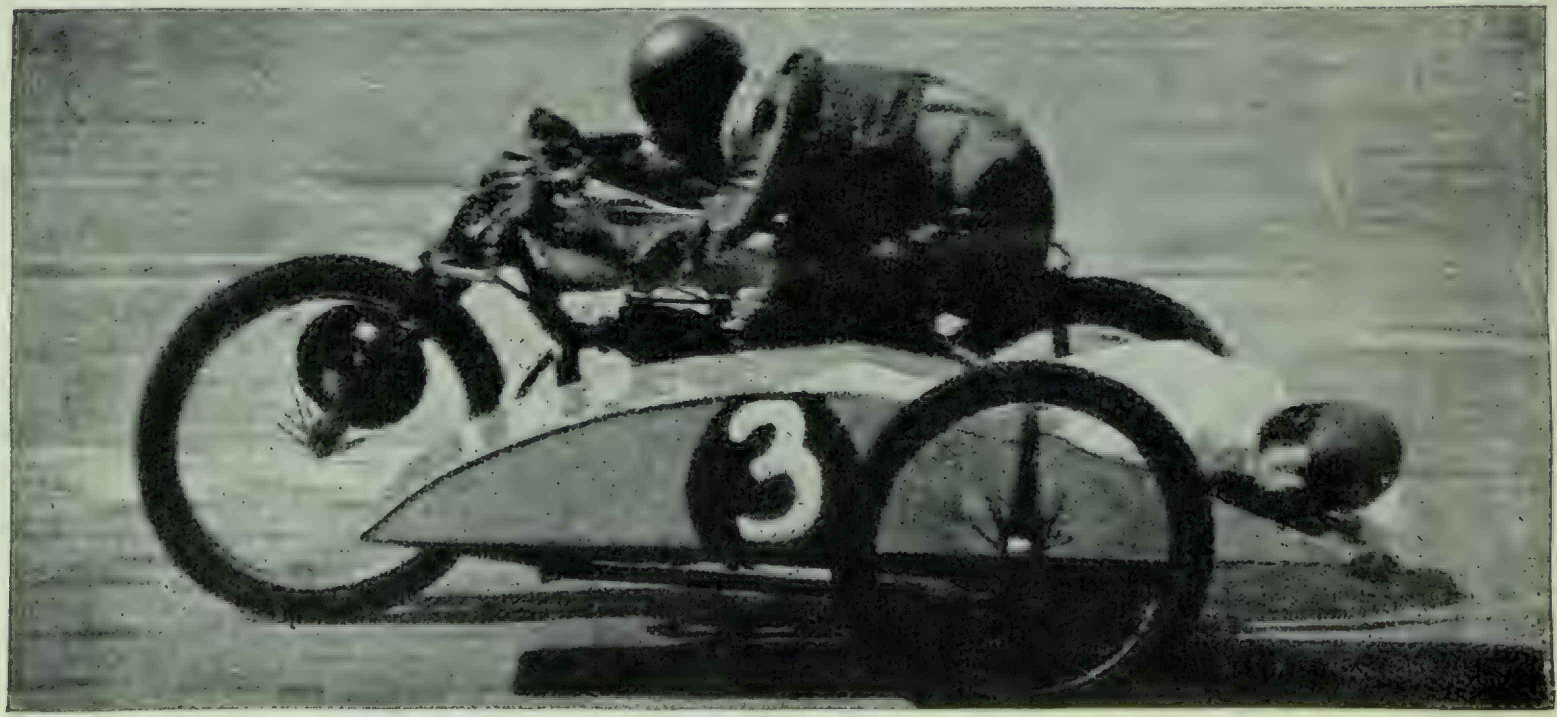
But no one believes that man has yet reached the limit of speed by machinery, and it is already unofficially claimed that the engine-driven racing car will soon be obsolete, as a German car propelled by the successive explosion of rockets is said to have reached the amazing speed of 435 miles an hour, although this has not been accepted as an international record.

British motor workmanship is known all the world over, and gruelling endurance tests are arranged to ensure the efficiency of British products. Here is a motor cycle and side-car test in progress over difficult ground.

Amongst the most famous motor car drivers the deeds of Mr. Kaye Don, who has driven a car at more than 100 miles an hour and a motor boat, *Miss England III.* at 119.75 miles an hour on July 18, 1932, and Sir H. O. D. Segrave, who achieved a speed of 231.36 miles an hour in 1929, in his *Golden Arrow,* and afterwards lost his life in attempting to break the world's record with a motor boat on Lake Windermere, stand as triumphs of pluck and skill.

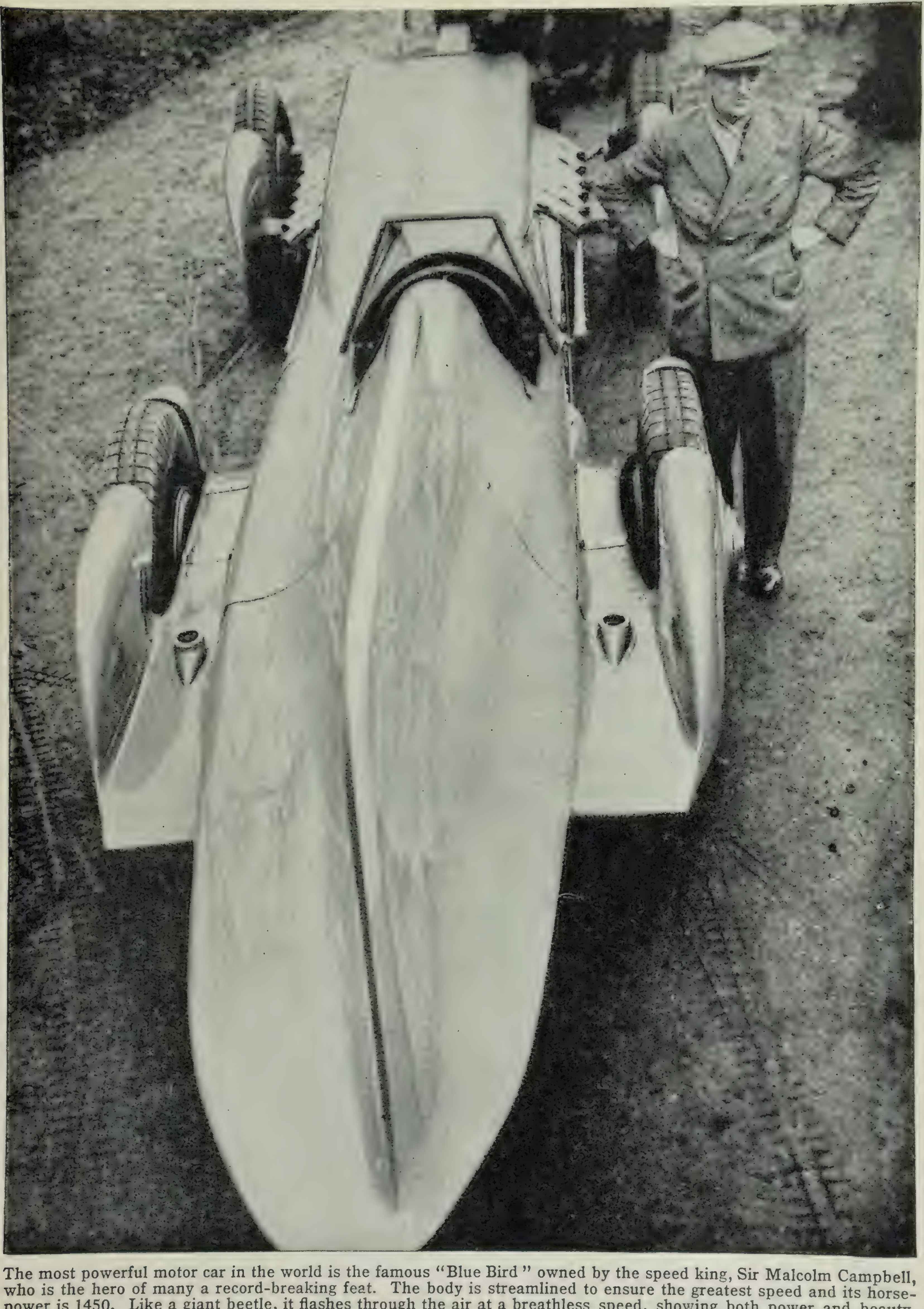
The prestige of Britain stands high in the nations of the world, and in the development of the motor car these super speed records, and the men who make them, are deserving of admiration, for they challenge competitors from all countries and yet win through.

In this country there are now more than two and a quarter million motor cars, vans, buses and other motor vehicles running over 177,000 miles of public highways, a truly wonderful transport development, and if some regular form of signalling is introduced with better safety rules for all who use the roads, the future of road transport will be one of usefulness to civilisation.



The craze for speed is here shown in a race for motor cycles and side-cars at Brooklands. Note how the passenger is almost lying down to assist his driver in keeping the machine balanced in taking a corner at lightning speed.

THE BLUE BIRD: KING OF RACING CARS



The most powerful motor car in the world is the famous "Blue Bird" owned by the speed king, Sir Malcolm Campbell, who is the hero of many a record-breaking feat. The body is streamlined to ensure the greatest speed and its horse-power is 1450. Like a giant beetle, it flashes through the air at a breathless speed, showing both power and beauty.

MEN MOUNT UP WITH WINGS, LIKE EAGLES

This picture has a two-fold interest for us. It shows a fashionable meeting in the days of ballooning, and gives an interesting glimpse at the fashions of last generation.

EVER since the earliest days men have longed to fly above the earth. They watched the birds, who seemed as though they merely flapped their wings and flew. Surely by making a pair of wings which might be attached to a man's body and which could be worked up and down rapidly, any man could fly. So many men thought all through the ages, but they did not think that the air was even more unstable than the sea. Whereas a ship will rock from bow to stern, or from side to side, aircraft may move in any direction.

A FIFTEENTH CENTURY PAINTER WORKS OUT AVIATION PROBLEMS.

But one man in the fifteenth century, Leonardo da Vinci, architect, engineer, artist and scientist, found that if man were to fly he must be supplied with wings which would make a variety of movements to keep on a steady keel. Da Vinci also thought a man could make enough power by his muscles to work the wings of a machine, and although there is no record of this wonderful inventor actually flying, his writings and models, especially of the parachute and helicopter, helped other men to think about flying in the right way.

Three hundred years later the two French brothers Montgolfier, experimenting with the idea of hot air which always rises, made several large balloons, below one of which a sheep, a cock and a duck were suspended. This trial trip was so successful that Pilatre de Rozier made an ascent in a balloon, thus becoming the world's first aeronaut.

From this time for many years balloon flights were made in various parts of the world and men strove to conquer the air. The French Government helped to forward these experiments, and in 1821 coal gas was used for the first time to fill out a balloon.

But the idea of making a man-lifting machine, or heavier-than-air machine which would really fly, was not altogether dismissed. Sir Hiram Maxim, whose name is connected with machine guns, made a big steam-driven air machine in Kent, in 1894, which rose into the air, but it was not a great success. Five years later balloons had developed into airships, which were balloons propelled along by revolving air screws, and the first of the famous rigid Zeppelin airships was under construction on the shores of Lake Constance in South Germany.

FIRST CAME GLIDING, AND LATER POWER WAS HARNESSED.

In another part of Germany, Otto Lilienthal experimented with different kinds of gliders, and not only had he become an adept at balancing himself whilst gliding through the air, but he proved the idea that a man could be supported by the impact of the air upon extended surfaces without the help of gases or lighter-than-air substances. Unfortunately Lilienthal was killed by his glider crashing, and it was left to two Americans, Orville and Wilbur Wright, away out on the sandhills of North Carolina, to follow up the idea of riding the air in a glider.

After studying all the literature they could find, the brothers Wright made model aeroplanes to test their theories. They at last came to the conclusion that wing surfaces had been made which, when moved at speed through the air, would not only lift the weight of a man, but also a motor which, in the airships then built, moved men through the air. The main

Here is an early type of monoplane—or aeroplane with single wing-spread. It was built about 24 years ago. Its wings were hump-backed and its framework slender.

Gliding, the first kind of flying attempted by man, is nowadays a popular sport both in Europe and America. The glider, an aeroplane without engine, is towed off from a hill and kept in flight by moving control or "joy stick." [*Flight*

problem, they thought, was to control the balance of a winged machine when it was flying through the air and to combine, if possible, the best kind of curved wing surfaces with the motor and air-screws which airships used.

Experimental flights were first made with kites and gliders carrying dummy figures to represent men, and so successful were these that on 17th December, 1903, Mr. Orville Wright went up himself in a motor-driven machine and made a flight which lasted only twelve seconds. This was the first time in the history of the world in which a machine carrying a man had raised itself into the air by its own power in full flight, had sailed forward upon a level course without reduction of speed and had finally landed without being wrecked.

THE ENGLISH CHANNEL IS AT LAST FLOWN, AND THE POSSIBILITY OF AIR TRAVEL PROVED.

Great secrecy was observed about the trials at the time they were made, but when the facts became known many people would not believe them. However, next year a passenger was carried, and flights were made by the brothers Wright lasting one and a half hours, and covering 76½ miles.

Stimulated by their success other experimenters tested out machines of different designs. A prize was offered for the first aviator who could fly with his machine across the English Channel, and on July 25, 1909, Mons. Blériot, a Frenchman, carried off the £1000 prize money by making the crossing over the sea in thirty-seven minutes.

But the machine which he used seems very tiny and frail nowadays. Since the day the Channel was first crossed by air enormous strides have been made in building heavier-than-air craft and aeroplanes. To-day it is quite commonplace for a giant air liner of the Imperial Airways, with 2200 horse-power engines, and weighing several tons itself, to take aboard passengers and their luggage, run across a wide field, lift itself up into the air and wing away on its voyage to Paris at 100 miles an hour.

The power and ability to fly, and the speed at which great distances could be covered by air, gripped the imagination of many people, and it is not surprising that numbers of notable records have been achieved by modern aircraft and their pilots. Inventions followed each other rapidly, and many different types of machines were perfected. After the English Channel had been so successfully flown, the wild wastes of the Atlantic Ocean appealed to

The autogiro adds a new feature to heavier-than-air machines. Here is a "windmill" propeller enabling the machine to rise or descend vertically. This makes flying possible where there is no proper landing ground. [*Flight* many flyers as the unknown to be fought and conquered.

So it is that as long ago as 1919 two British airmen, Alcock and Brown, set out from Newfoundland to fly to this country. After a wonderful non-stop flight of 1890 miles these intrepid pioneers landed safely in Ireland sixteen hours twelve minutes after leaving Canadian soil. This truly remarkable flight was for many years a record, but in 1927 a lone American airman named Lindbergh set off from New York to fly to Paris, and when he succeeded in covering 3639 miles in 33½ hours without a stop, the whole of the new world acclaimed him as the hero of an epic flight. The Atlantic has now been crossed many times by aeroplanes and by seaplanes, which are fitted with floats for landing and leaving water, instead of wheels for use on the ground.

PIONEERS OF THE AIR, WHOSE DARING VENTURES WILL LIVE ON.

One of the most popular pioneers of the air, who has earned the title of the "Flying Scotsman," is J. A. Mollison, who has many air records to his credit and was the first man to fly both the North and South Atlantic. "Jim" rose to fame when, in 1928, he flew from Australia to Britain, breaking the previous record by 49 hours. In 1932, he flew from England to Cape Town in 4 days, 17 hours, and 19 minutes—one of the most amazing air-feats on record. Later in the same year, he was successful in making the first solo east-to-west flight across the North Atlantic in a light machine.

This popular hero of the air is the husband of Miss Amy Johnson, a Yorkshire lady, who has proved that women as well as men can make epic flights. She flew alone from London to Australia in 1930, and in November, 1932, broke the record of the fastest time from England to South Africa by flying from Lympne to Cape Town, 6220 miles, in four days six hours and fifty-four minutes. She and her husband have risked their lives many times and have done much to help aviation.

A few years ago a French engineer, Jacques Schneider, offered a trophy for the fastest speed reached by a seaplane, the trophy to be competed for internationally. Although in the 1913 Schneider contest the fastest speed, reached by a French seaplane, was only 45¾ miles an hour, the trophy was won in 1931 for Great Britain by Flight-Lieutenant Stainforth, who actually flew at a speed, a few days after the race, on September 29, of 407.7 miles an hour, the fastest speed at which a human being has ever moved.

CONQUEST AT LAST! AIR SERVICES TO DISTANT LANDS.

With the coming of dependable aeroplanes a new travel and transport route map of the world is coming into existence. Air ports, or stations at which air liners land, and where travellers and merchandise may be changed from air liner to air liner, are taking shape, and already regular services with giant machines are being operated from the Air Port of London, at Croydon, to Paris, Cologne, Berlin, India and South Africa. These airways are growing in popularity every year, and the Imperial Airways, which have a fine record for safety, last year flew their liners no less than 1,722,000 miles. Two thousand passengers and 107 tons of letters and mails were carried through the air, and ninety-seven out of every hundred of the services planned were carried through according to schedule, the other three per cent. being cancelled owing to the weather or for other reasons—a very fine achievement.

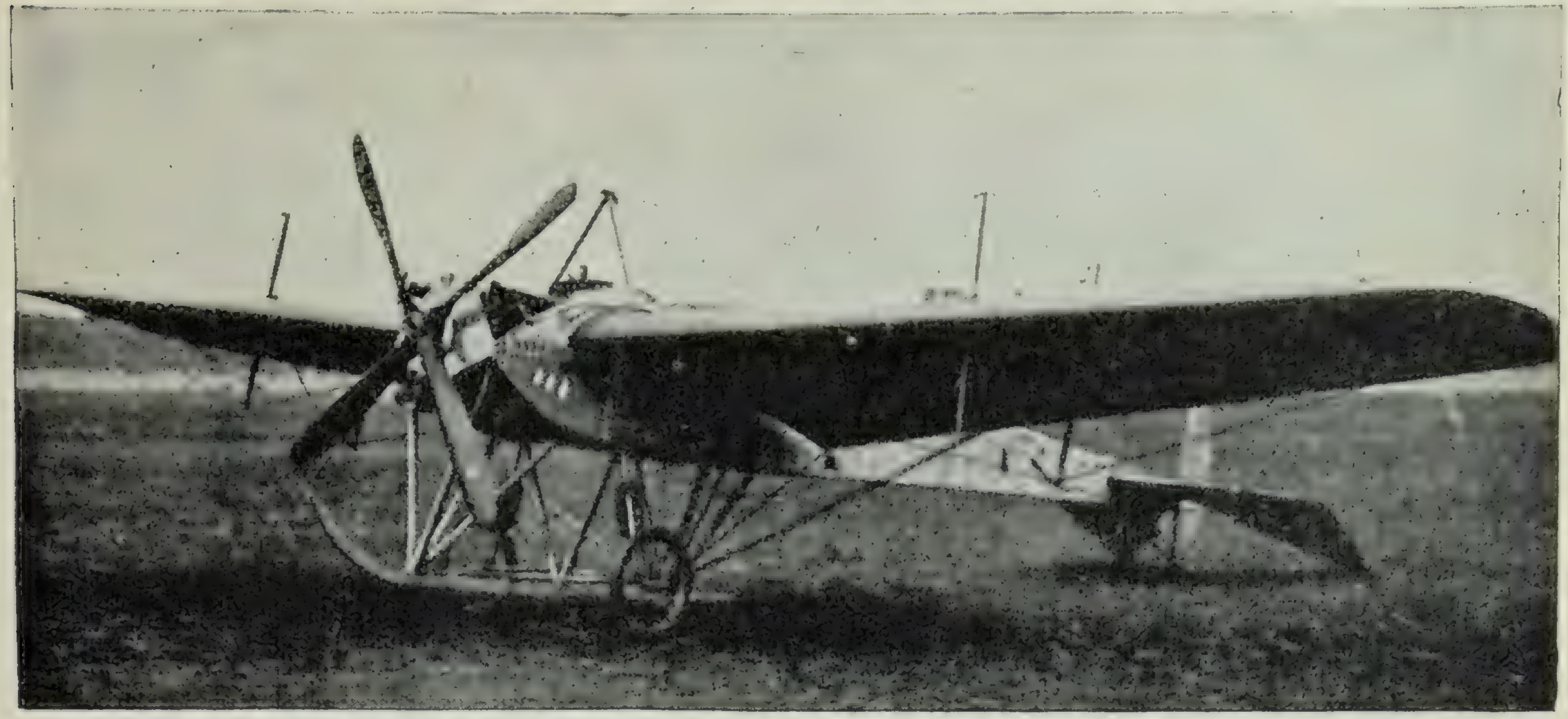
Both aeroplanes and seaplanes are used on the regular air routes, and in North and South America, and Europe, the governments are helping forward the building up of these new ways of communication between cities and countries.

Still bigger flying-boats are also being planned. A monster ocean-going machine, weighing more than sixty tons, is amongst the newest proposals. This machine will carry 135 passengers, a crew of 35 men and, with a cargo, will be able to travel at a speed of 150 miles an hour for 3700 miles without alighting. An immense wing nearly 300 feet long will have mounted upon it ten 1000 horse-power engines with propellers. A truly amazing flying-ship, which is not, however, beyond the bounds of possibility. It would be able to float on the water whenever it was not up in the air.

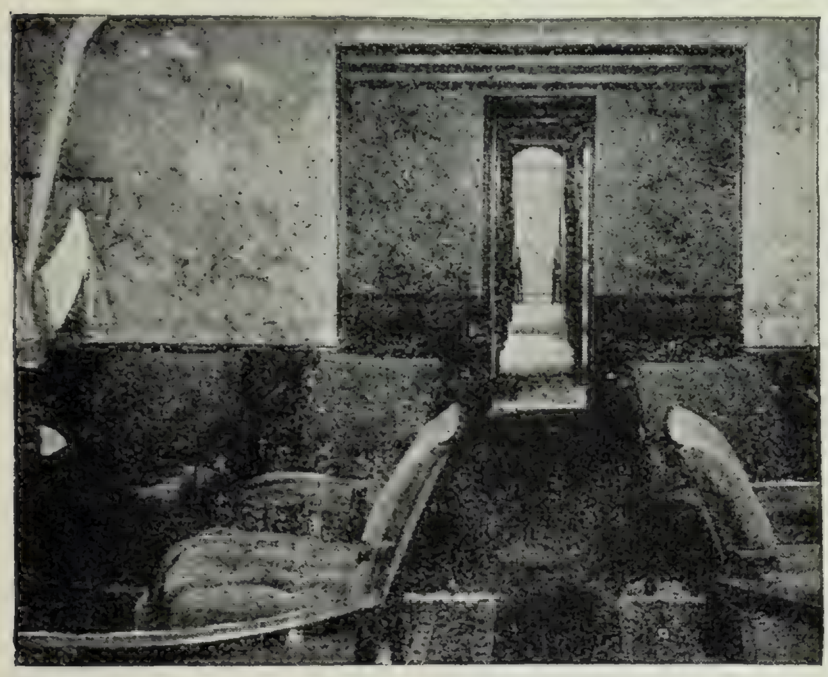
FAIRY TALES COME TRUE IN THE GIANT AIRCRAFT OF TO-DAY.

Already the famous Graf Zeppelin, in Germany, has sailed from Lake Constance, where it was built, to Tokio, in Japan, a distance of 7500 miles in 100 hours, and also has successfully crossed the South Atlantic Ocean from Germany to South America nearly a score of times. Unfortunately, British-made airships, or dirigibles, as they are called, have not been so successful. Several of our giant airships have come to grief with grave loss of

FLYING PALACES OF COMFORT AND LUXURY

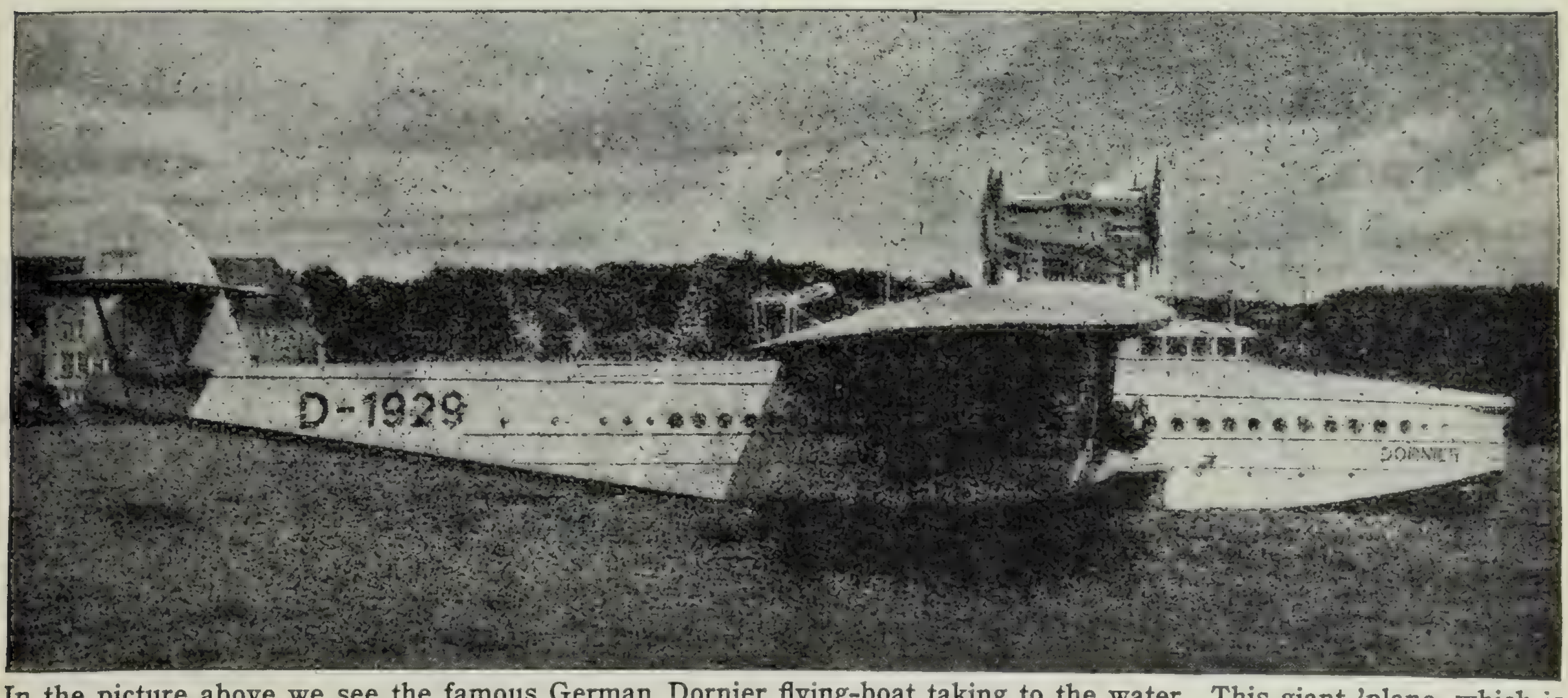


This machine, which looks like a giant grasshopper, is an early type of Monoplane. Ever since the first 'plane took to the air, inventors have been striving to make improvements, till to-day there is much more security in air-travel.

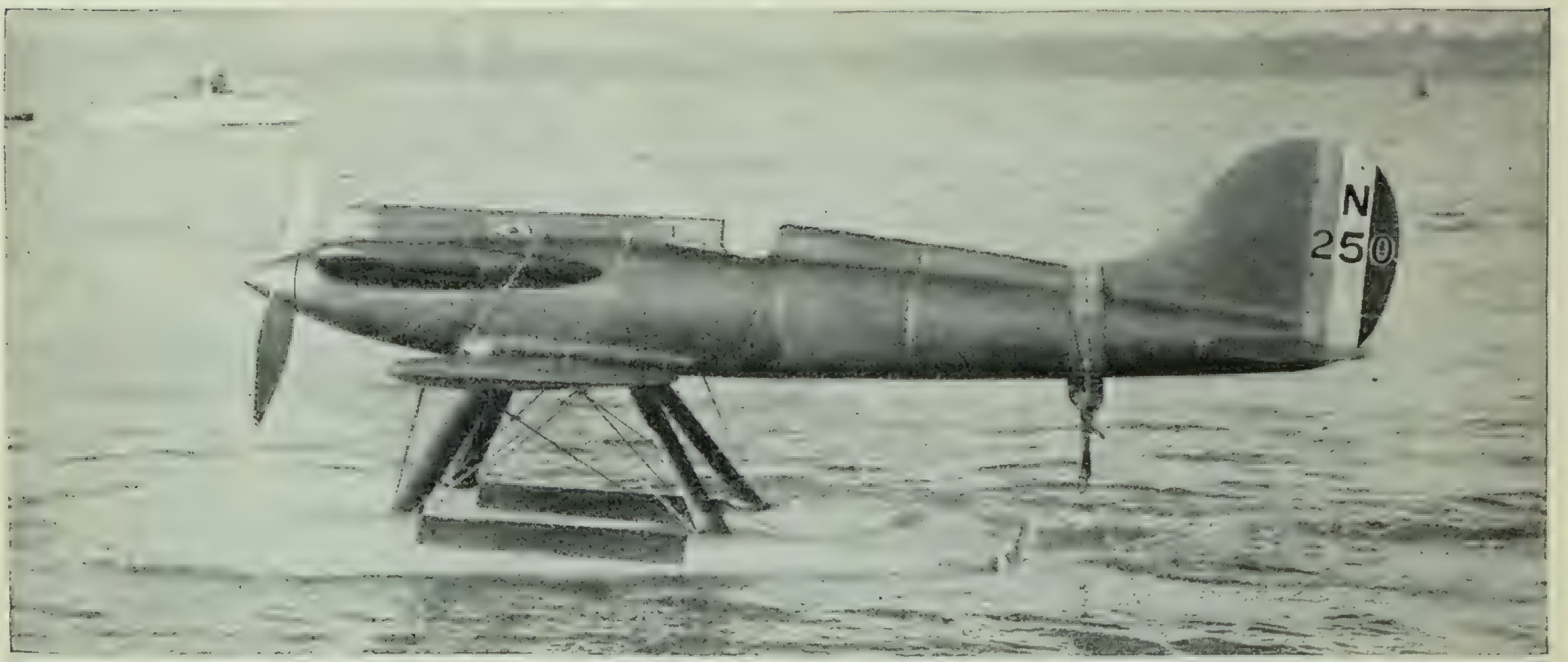


Travelling by air need not mean discomfort, as we can see from this view of a luxurious cabin in the Dornier sea-plane.

This is another view of the Dornier from inside. Air-passengers can sit here in comfort while they race the clouds.



In the picture above we see the famous German Dornier flying-boat taking to the water. This giant 'plane, which is fitted up to give the maximum of comfort to passengers, shows the rapid advance in air-craft in recent years.



A Schneider Trophy machine, one of the fastest machines ever designed by man. Modern speed aircraft are built in such a way as to offer very little resistance to the wind. This method of design is known as stream lining. There is small space for the pilot. Such a machine could fly from London to Glasgow in little more than an hour.

life, and yet some men think that if an airship were to be built large enough and strong enough it would be able to withstand all the winds which blow.

ON THE WINGS OF THE WIND! SPEEDING UP THE WORLD.

So far, however, aeroplanes and seaplanes have far outstripped airships and balloons in the matter of speed. The fastest speed attained by an airship is only 81½ miles an hour, which is only half the speed at which a fast, heavier-than-air machine can now travel.

Bigger airships and larger aeroplanes and flying-boats are suggested, but the future of both is as yet unknown.

Meantime, small aeroplanes are growing in number, and flying clubs are teaching more and more people how to fly. Fighting aeroplanes and bombing machines are being developed by each nation, although there is rightly a feeling throughout the world that this new power which has been discovered by man shall not be used for evil, but rather for the good of as many people as possible. New journeys are being made possible by the aeroplane; doctors may travel more quickly to help to save a patient, invalids can be flown away to a better climate, and new joys and horizons are opened up by air travel, which is expanding every year.

WILL MAN NEVER REST CONTENT? EXPERIMENTS STILL PROCEED.

And there are many ideas which may play a part in the aircraft of the future. Flying is still a young science. It has now been made safe, reliable, and regular, but the busy brains of inventors are always at work finding out new things about the air. What is called the "helicopter," for example, is being tried out. This is a machine which will rise and descend vertically with the help of swinging wings. In this machine it is possible to come to a standstill in mid-air and descend upon a precise spot.

Another type of machine depends upon the discharge of a gas to propel it forward, and yet another type is pushed through the air by propellers behind instead of being drawn forward by whirling blades mounted in front.

THE WONDER OF MODERN INVENTION, AND PROBLEMS STILL TO BE SOLVED.

Ever since the Middle Ages when mystery surrounded the sciences, and alchemists worked in secret caves and laboratories, men have thought how wonderful it would be to travel by a balloon or a rocket off the earth's surface into the skies and visit, say, the Moon. Some attempts were made, but no very great heights were reached. More often than not an explosion occurred and the secrets of the experimenter were lost for ever in the ruins of his lonely den.

Recently, however, with the widespread use of radio, scientists have more than once turned their minds towards the conditions which may exist above the air which we breathe. It is known, for instance, that radio, heat, infra-red, light and ultra-violet rays travel in straight lines. When a big searchlight is turned to shine up into the sky at night it is easy to understand this. But how far does this beam of light go and what happens to it when it is out of sight? Again, wireless waves go out from a transmitting station in various directions. They are picked up many miles away more distinctly by night than by day—why?

In connection with the important subject of forecasting the weather, too, there is much yet which is not known. Observers who have bravely spent whole winters in snow huts on the ice fields of Greenland, have found out facts about the beginning of weather changes which are felt in Britain days afterwards. And it is probably from the upper atmosphere and from the spaces above the air belt which surrounds the earth that changes in the weather also come.

TEN MILES UP INTO THE SKY AND SAFELY DOWN AGAIN.

So to explore this unknown region which is sometimes called the *Stratosphere,* Professor Piccard has on two occasions travelled upwards in a specially made cabin or gondola attached to a balloon filled with hydrogen gas. Both ascents were made in enclosed spherical cabins into which the intrepid scientist climbed after loading aboard all manner of thermometers, altitude meters and devices to register the conditions of the upper spaces. With the help of supplies of oxygen he was able to seal himself in entirely, and yet breathe for the short time which his vertical journeys lasted.

Very careful and accurate calculations were made to supply just enough hydrogen gas into big balloons so that the fabrics would be able to expand when the more rarefied and airless strata of the off-the-earth spaces were reached. So complete were these and other details of the ventures that on both trips Professor Piccard sailed safely upwards, floated over a distance of several miles and dropped downwards so that he could step out again as the cabin reached the ground. Weather forecasts were watched to select a clear and tranquil day for each attempt, and by carrying ballast which was dropped just at the right moment, the downward progress of the balloon was checked. On the first trip, however, the cabin alighted high up on an Alpine glacier or river of ice amongst the region of eternal snows at Obergurgl. Professor Piccard and his assistant clambered out and eventually found shelter in an Alpine climber's hut. Unfortunately, the metal cabin had landed in such a difficult position that it was not possible to take it down the valley and send it back to the starting point, but the scientist recovered all the instruments and records of the trip, which, after his personal safety, were the things that mattered most.

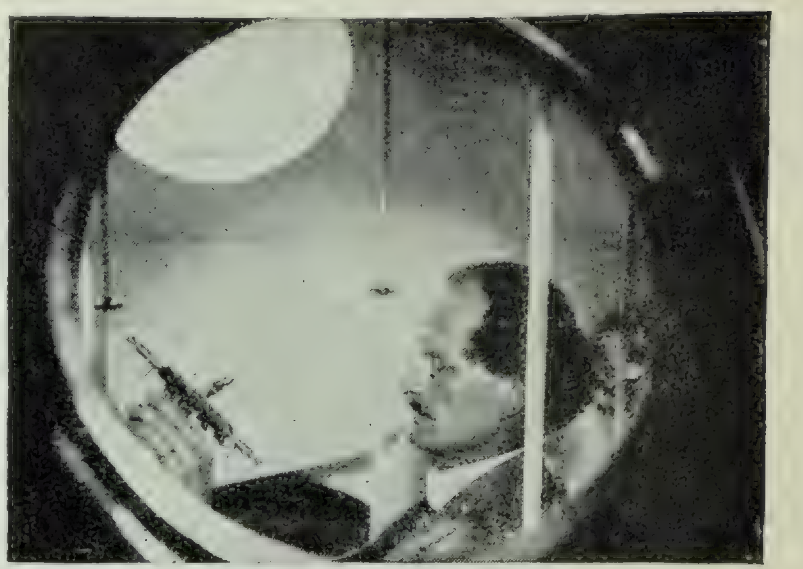
Where air-passengers await their plane in comfort. Above is the spacious waiting-room at London's airport. To-day it is as simple to travel by air as by railroad.

Above we see the outside of the airport where travellers, who have arrived in London by aeroplane, are leaving for town, after their flight above the clouds.

On this first venture the sealed cabin was painted black, and although high up the temperature outside was very cold, both the scientist and his assistant suffered from the heat of the sun's rays, which were absorbed by the black metal, making the inside of the cabin very warm indeed.

WILL THE PROFESSOR EVENTUALLY GET TO THE MOON?

For the second trip a new cabin was built which was painted white. The balloon was filled with hydrogen and, on August 17, 1932, Professor Piccard and a young scientist, Doctor Cosyns, climbed aboard, waving farewell to a crowd of helpers who at a given signal let go the ropes, allowing the balloon and its precious cargo to lift into the air. Air pilots in aeroplanes also took off from the ground to fly around the balloon and keep it in sight as long as possible, whilst parties of the scientist's friends, with field glasses and fast motor cars, watched and kept themselves ready to dash across country to any point where the balloon was likely to come down.

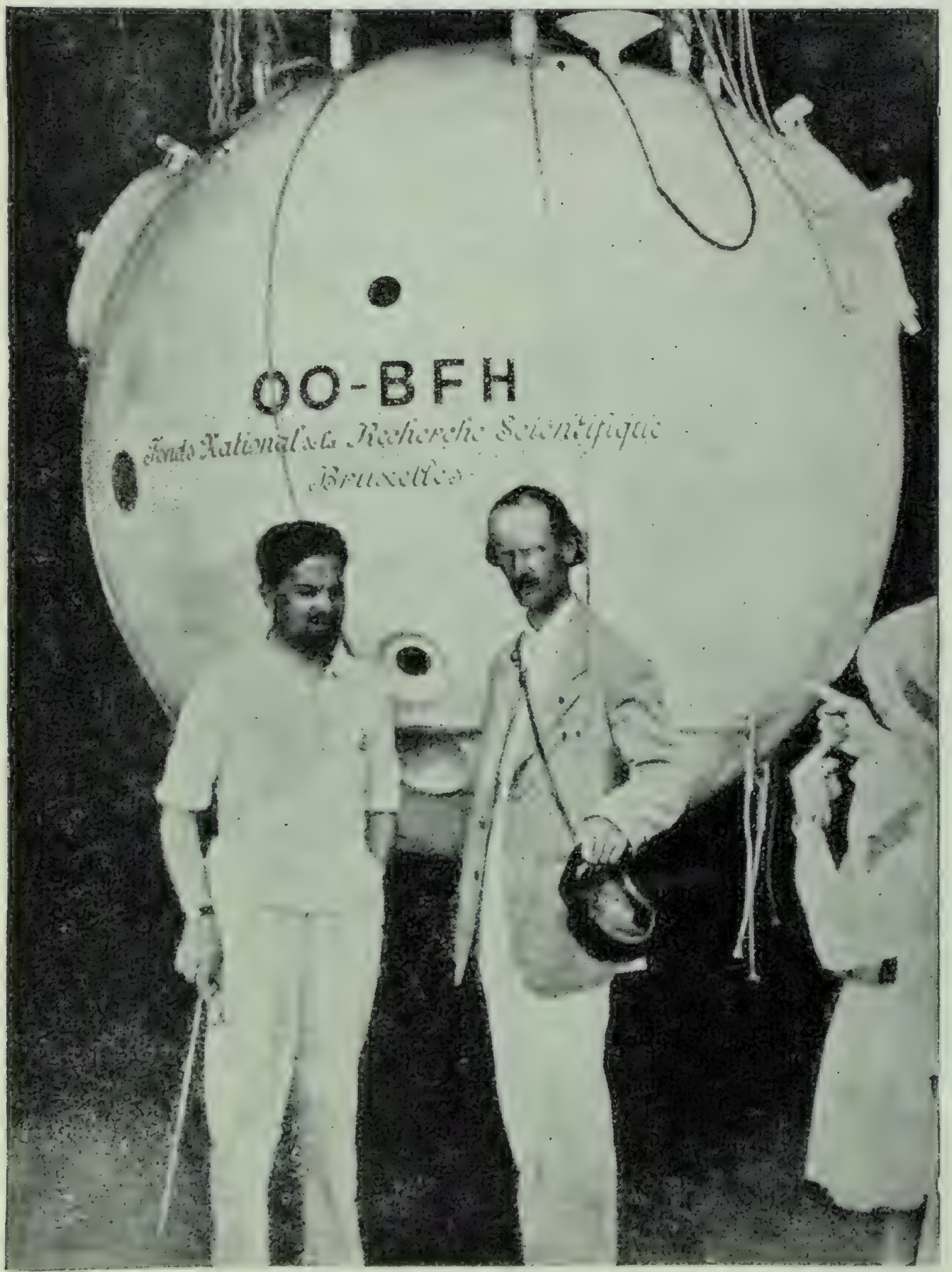


Professor Piccard, at the risk of his life, soars into the sky to an altitude of almost ten miles above the earth.

WHAT IT FEELS LIKE TO FLOAT HIGHER THAN THE MOUNTAINS.

Higher than the top of Mount Everest, the highest mountain in the world, went the tiny cabin dangling at the end of the balloon ropes, reaching the enormous height of 16,201 metres, which is well over nine miles. At this altitude it is icy cold, and the two men inside the cabin suffered intensely. At last the limit of the venture was reached and the descent was begun. Every minute was taken up with work upon delicate instruments. Down, ever downwards, the balloon coming to earth in Northern Italy after a wonderful flight lasting from five o'clock in the morning to five o'clock in the evening. Bumping once or twice, the two men inside the sealed cabin were dazed when they made their way out. The contrast between the heat of the Italian plain on which they had landed and the cold stillness of the skies was so great that it was some time before they became accustomed to the change. Asking the peasants who gathered around them not to smoke, because of the danger of fire from the escaping gas, the professor was soon able to find his friends and to take away the deflated balloon and the cabin with all its precious instruments to Zurich.

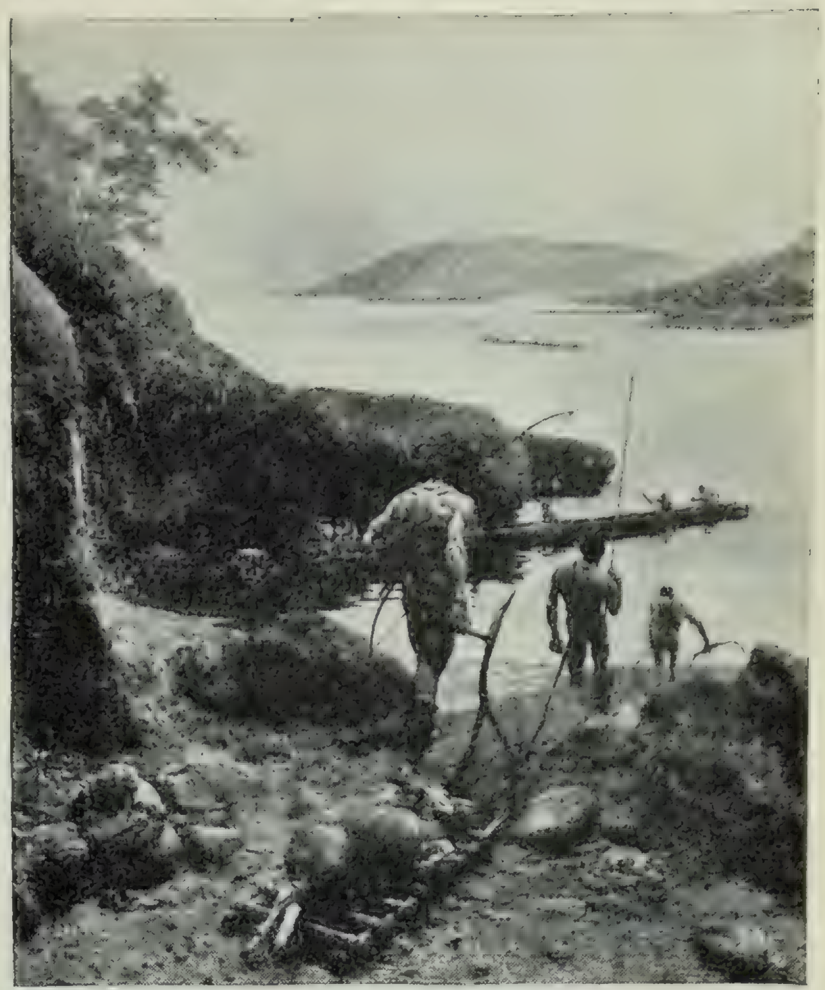
He is a brave pioneer, venturing into the unknown, and seeking, at the risk of his life, to learn for the benefit of others, so that one day people may be able to travel, by sealed air liners high up above the clouds and stormy weather, from one part of the world to another, or even, at last, as far as the Moon—who knows?


OO-BFH
Fonds National de la Recherche Scientifique
Bruxelles

The Professor, with the Italian Air-Minister, standing beside his famous balloon, which is attracting a great deal of attention from curious onlookers. [E.N.A.

FETCHING AND CARRYING THROUGH THE AGES

In olden days, long before man had ever dreamt of aeroplanes and railways, the problem of how to transport their goods from one place to another caused the people much worry. Here we see a man of the Stone Age, using his own broad shoulders to bear the burden of an animal which he has slain. On water, clumsy log rafts were used.



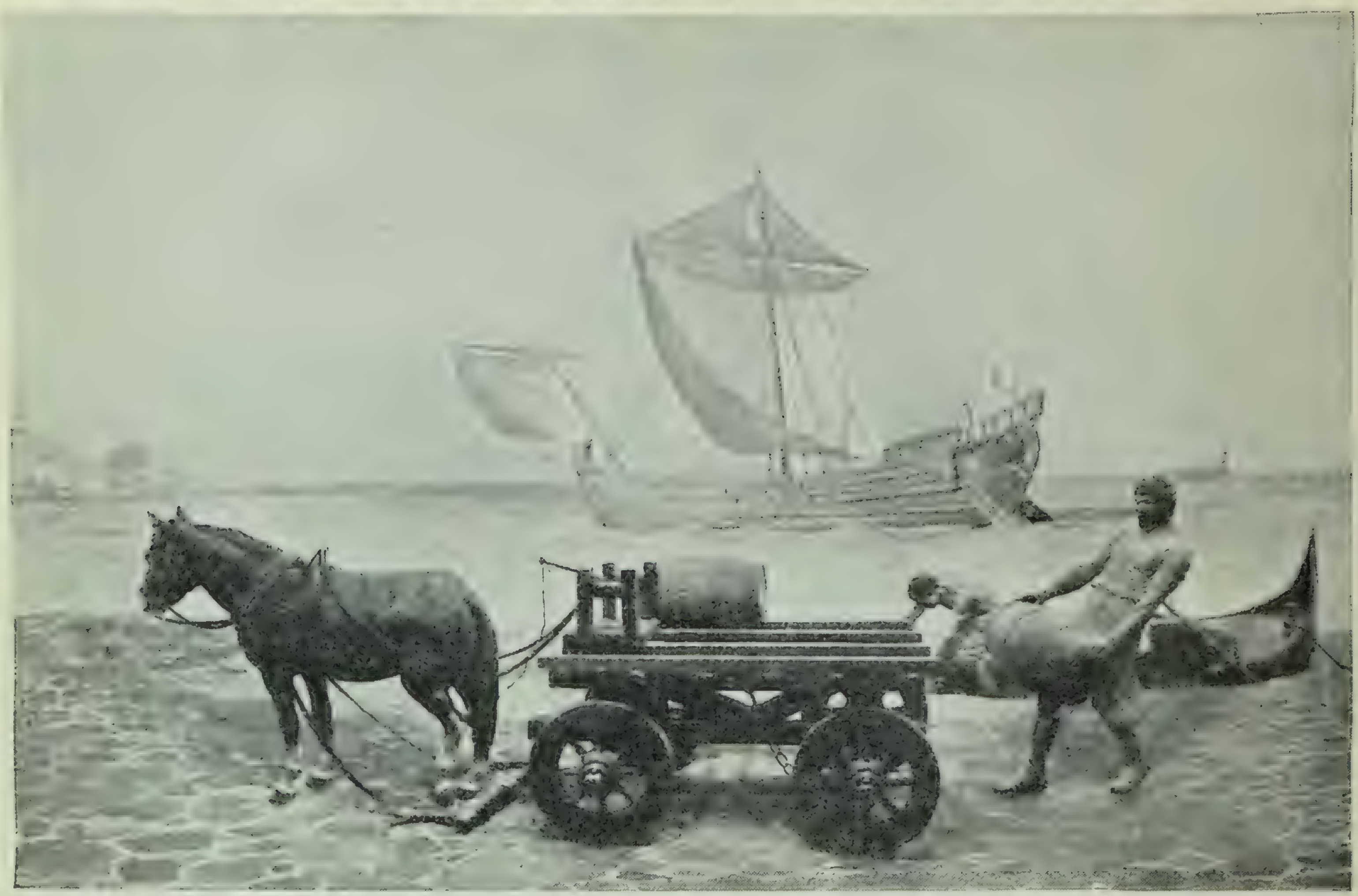
Man had begun to use his brains and had discovered that with a little invention he could ease his burden. In the Neolithic, or late Stone Age, he contrived a sledge with which he dragged his goods from place to place and found this easier than carrying them. Next he hollowed out a log and made a rough type of canoe.

When the ancient Egyptians wished to move heavy objects they used the roller—a forerunner of our modern wheel. Even then, many hands were needed to pull heavy goods. In the interesting picture above, a band of slaves are hauling a huge structure on which we see poised a man who, by clapping his hands, acts as their time-keeper.

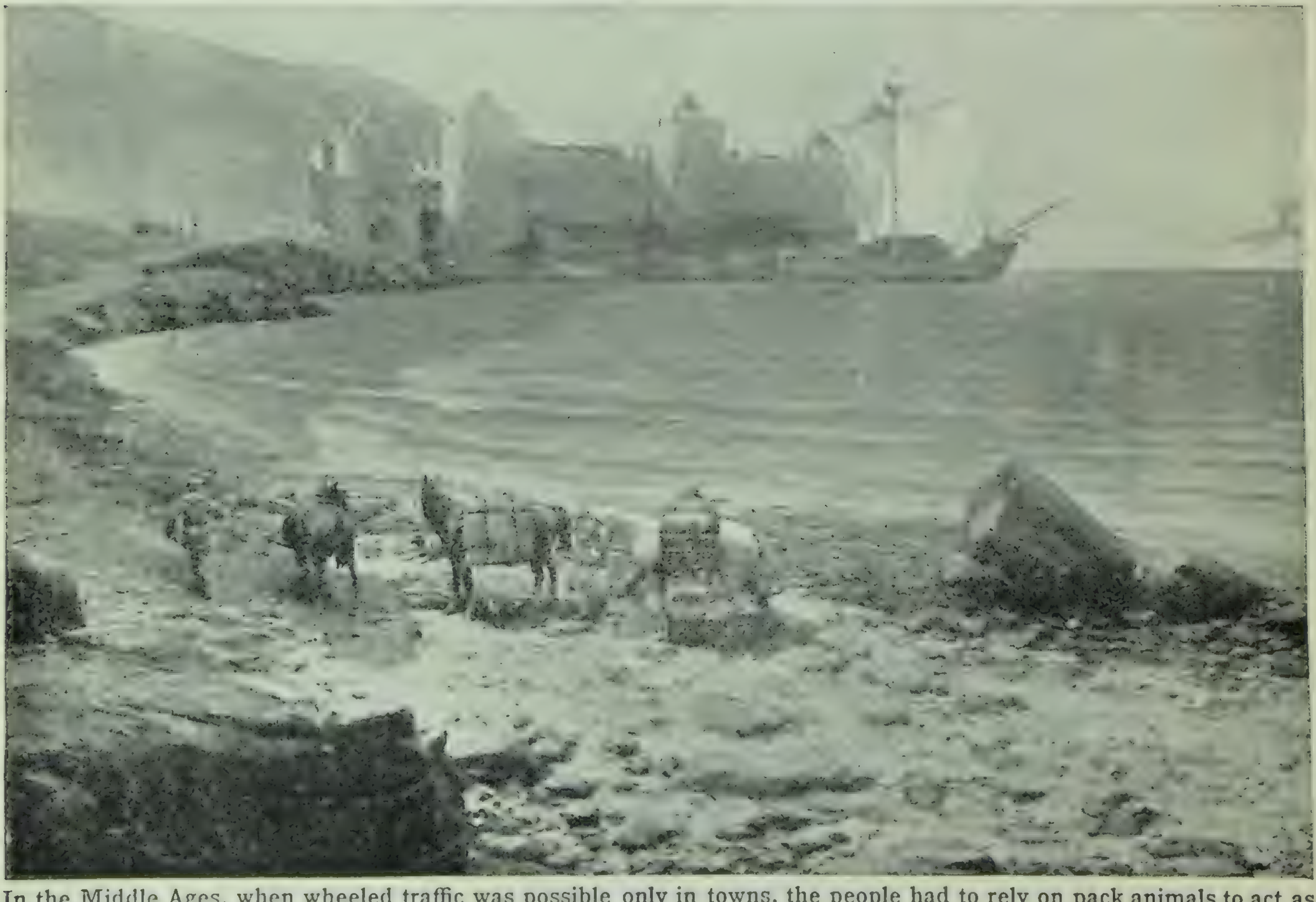
After a time, man, who was beginning to think things out more and more, discovered that he could tame animals and use them to carry his goods for him. This lightened his burden and made transport very much quicker and easier. Even to-day, this primitive method of haulage is still used in North China, where roads are not good.

[Illustrations by courtesy Science Museum London

HORSE AND SAILING SHIP ONCE HELD SWAY

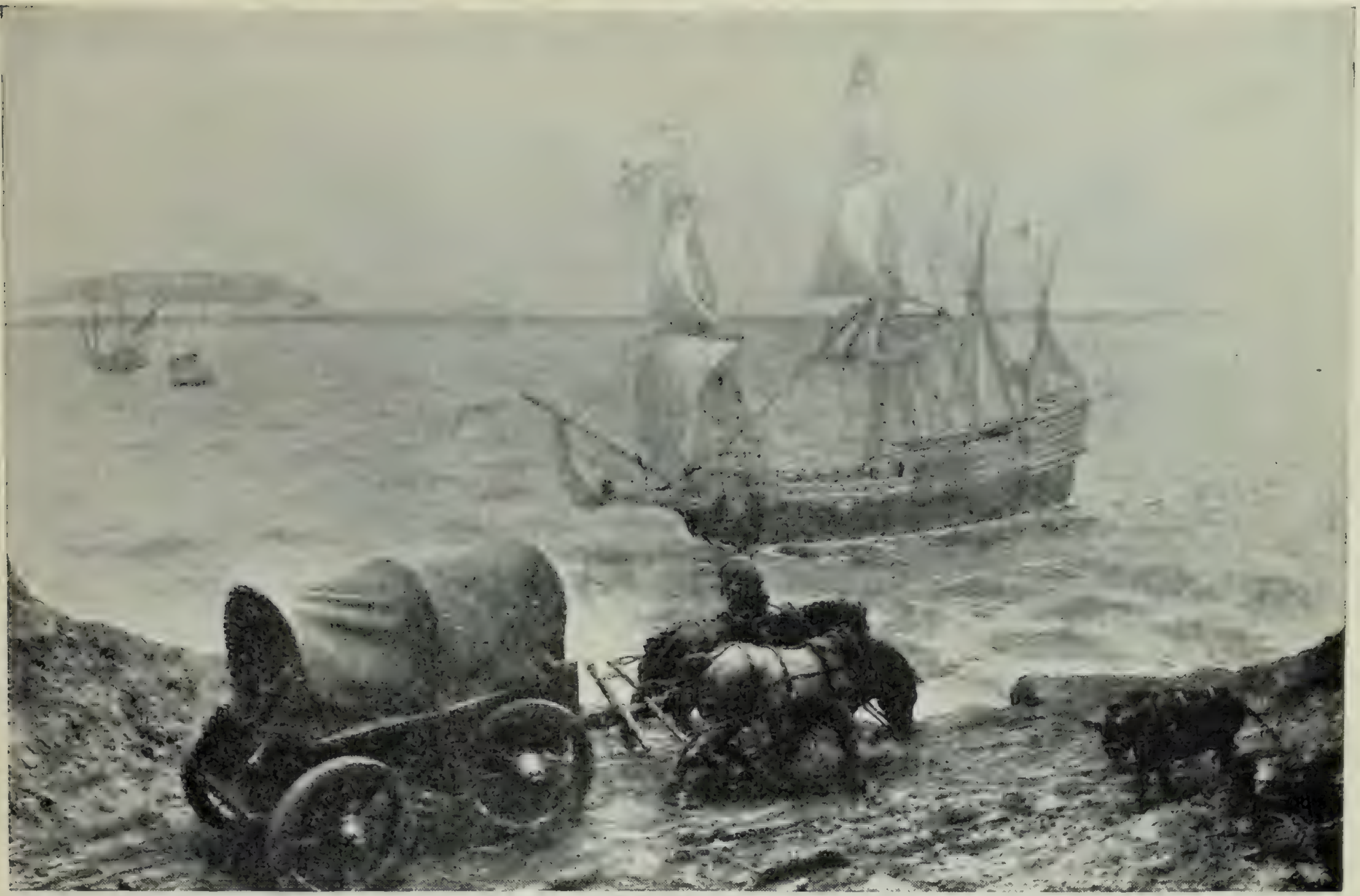


In Roman times it was difficult to find methods of transport. The people, however, had to find a way of moving goods, so they invented the wheeled dray, which we see above. On sea, canoes gave place to sailing vessels. The Roman galleys were graceful craft, rowed in rhythmic fashion by slaves, working under an overseer who beat out the time.

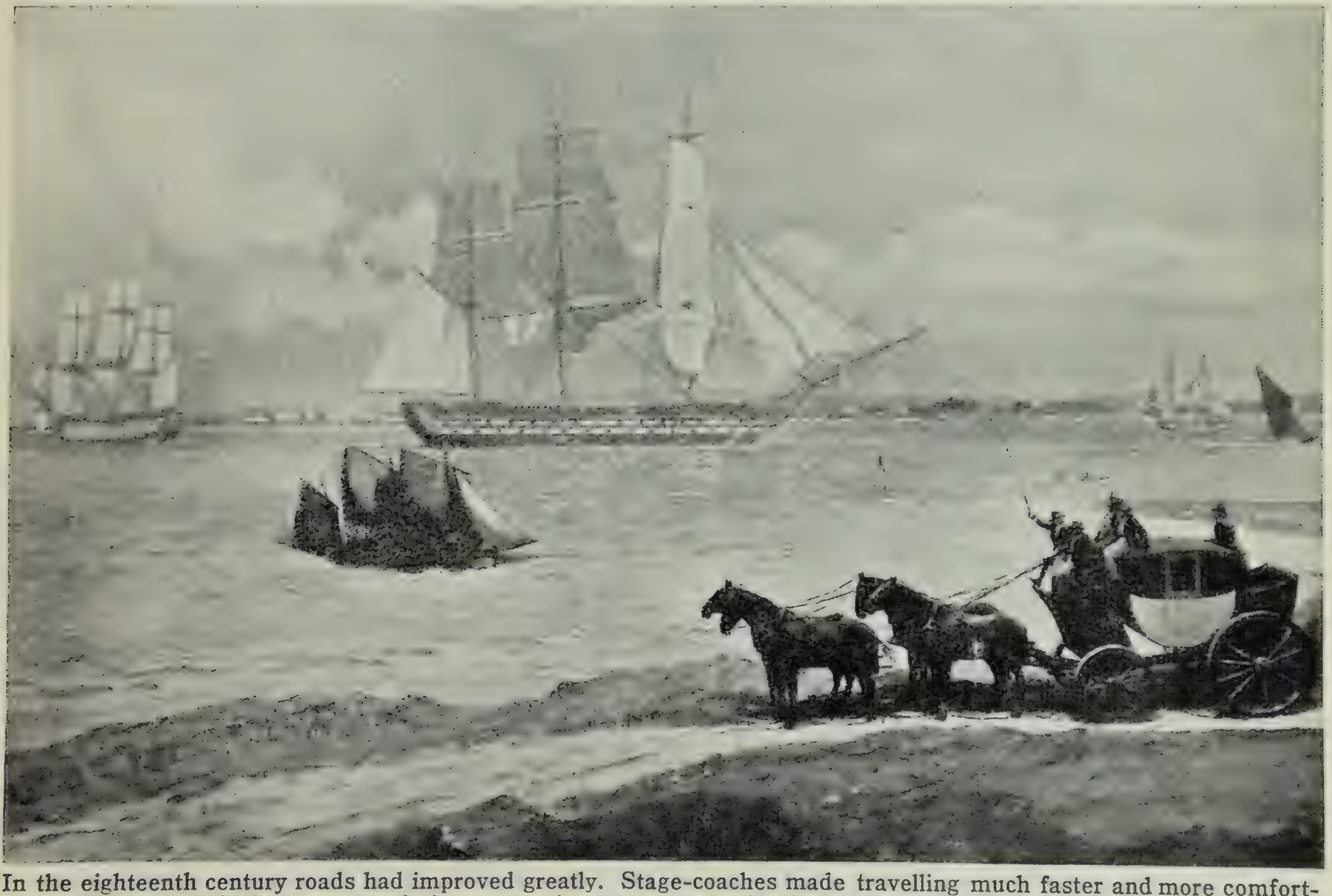


In the Middle Ages, when wheeled traffic was possible only in towns, the people had to rely on pack animals to act as burden-bearers. Above we see some of these human luggage-carriers struggling along patiently with their burdens. The weight was equally distributed on the patient animals by being divided into two equal portions, one resting on each flank.

TWO CENTURIES OF LAND AND SEA PROGRESS



In Tudor times roads were so rough that only very heavy wagons with wide wheels could jog over them. Ships, however, had improved. Although they still travelled slowly, more sails and higher masts enabled them to sail round the globe. It was in Tudor times that our Navy really became a conquering force.



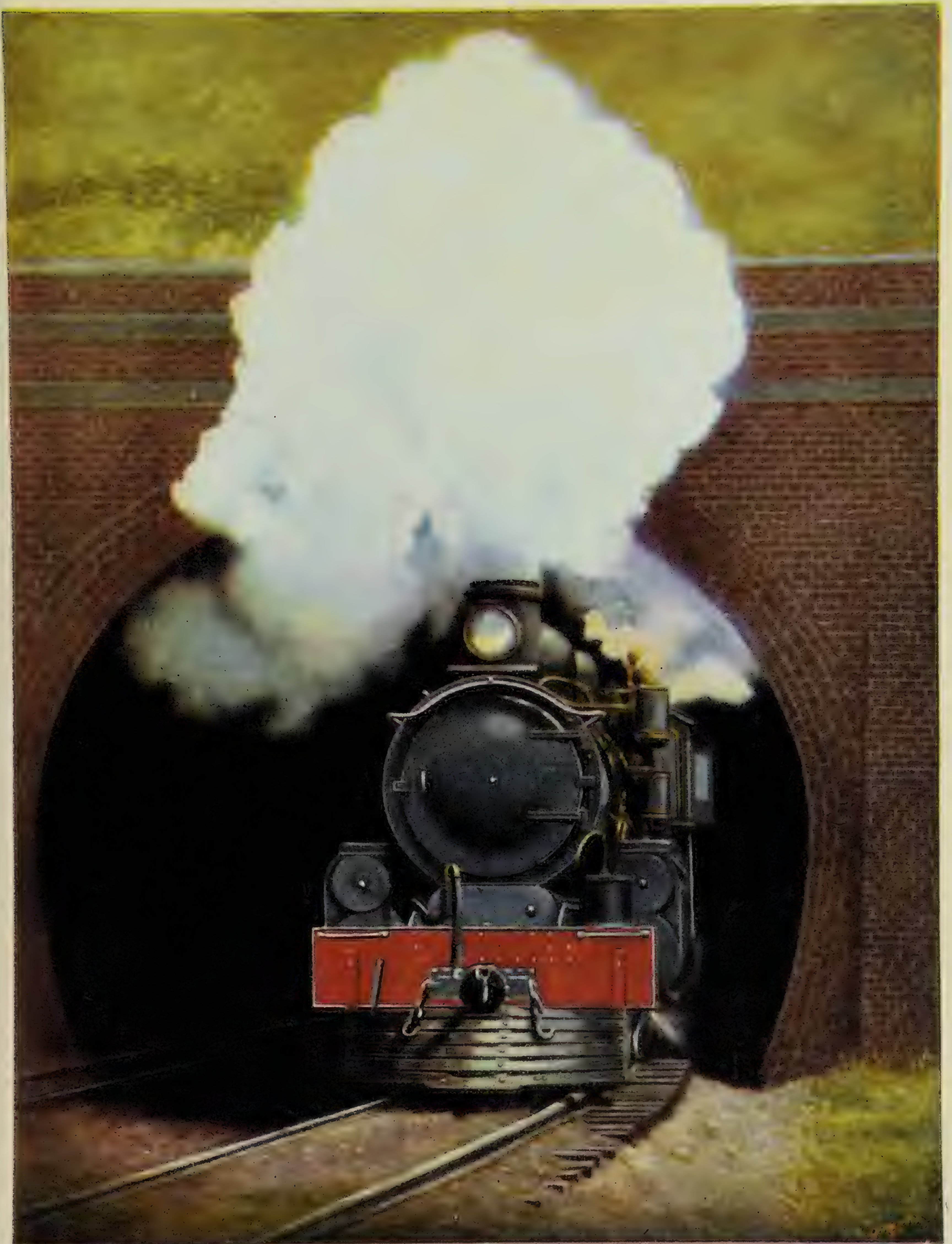
In the eighteenth century roads had improved greatly. Stage-coaches made travelling much faster and more comfortable. Ships, too, had grown much larger as time went on and sailed farther afield in greater safety. The late eighteenth century was Nelson's age, when our Navy proved herself mistress of the sea.

THE MACHINE CONQUERS AIR, ROAD AND SEA

England, in the early nineteenth century, began to waken up. Many strange conveyances threatened to oust lumbering stage-coaches. Steam carriages and railways were being perfected, and the clumsy hobby-horse appeared.

Transport advanced very rapidly at the beginning of the twentieth century. Motor-cars now flashed through the country with rapidity, and the aeroplane—that wonderful mechanical bird—skimmed swiftly through the air.

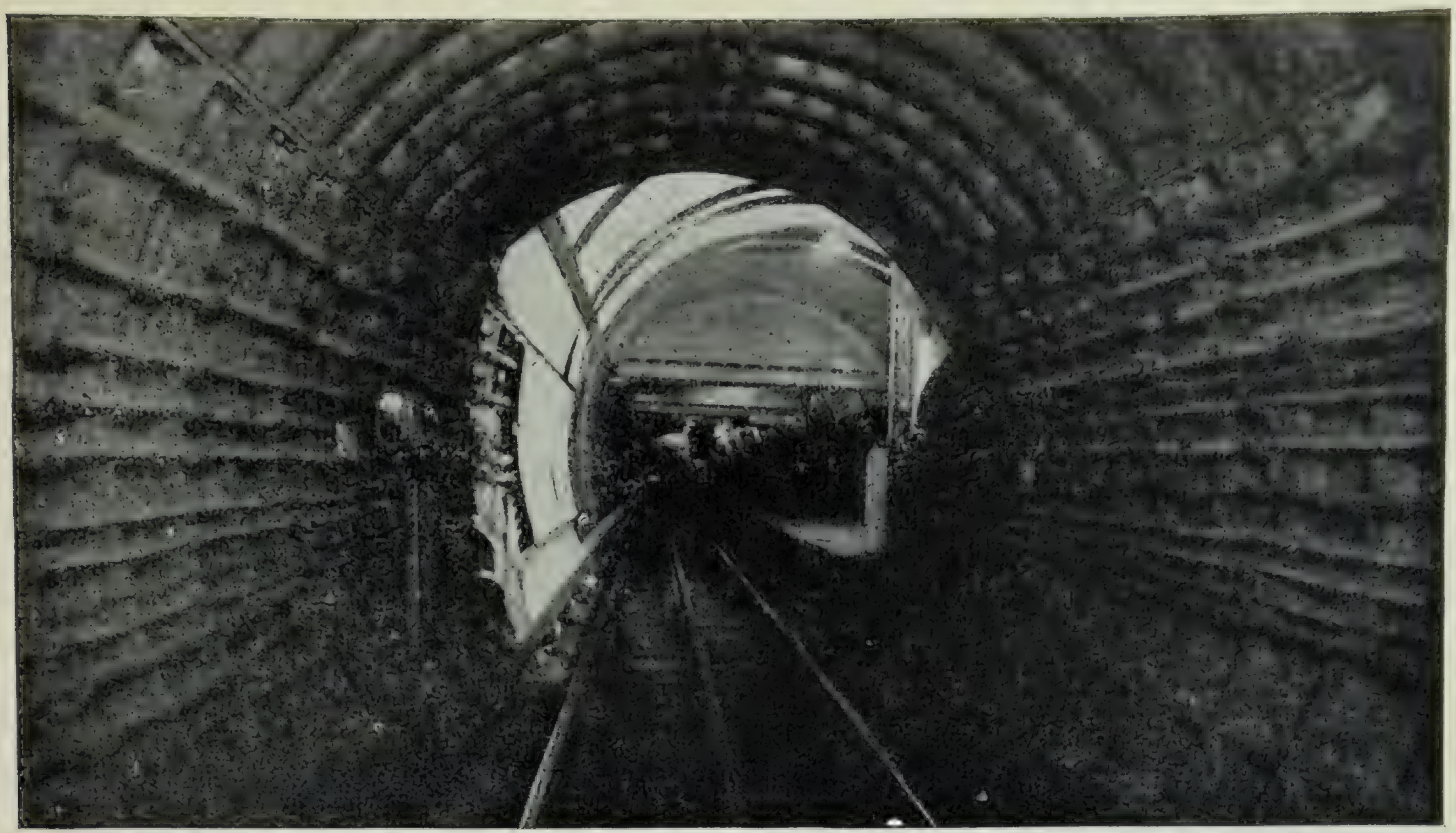
To-day, even our distant friends are next-door neighbours. Modern transport links us up with every country, and travelling is much simplified. The passenger aeroplane above skims through the air at 100 miles per hour.



THE MIGHTY POWER OF HARNESSED STEAM.

The famous Rotorua express thunders through a mountain side, bringing its passengers into full view of the lovely Rotorua Lake—a district of hot springs and wonderful volcanic scenery in the North Island of New Zealand.

BURROWING UNDER OLD LONDON TOWN



Next stop Waterloo! This is a view of the station as seen from the motorman's cabin of a tube train.

SEVENTY years ago there were a million and a half people living in London. But their numbers increased until to-day there are no less than eight million human beings who live and work within the Greater London area, which covers the amazing space of 699 square miles. In bygone days shopkeepers lived above their stores. Their boy apprentices slept in box-like beds below the shop counters at which the customers were served. People were herded together and the streets, which were narrow, were badly drained.

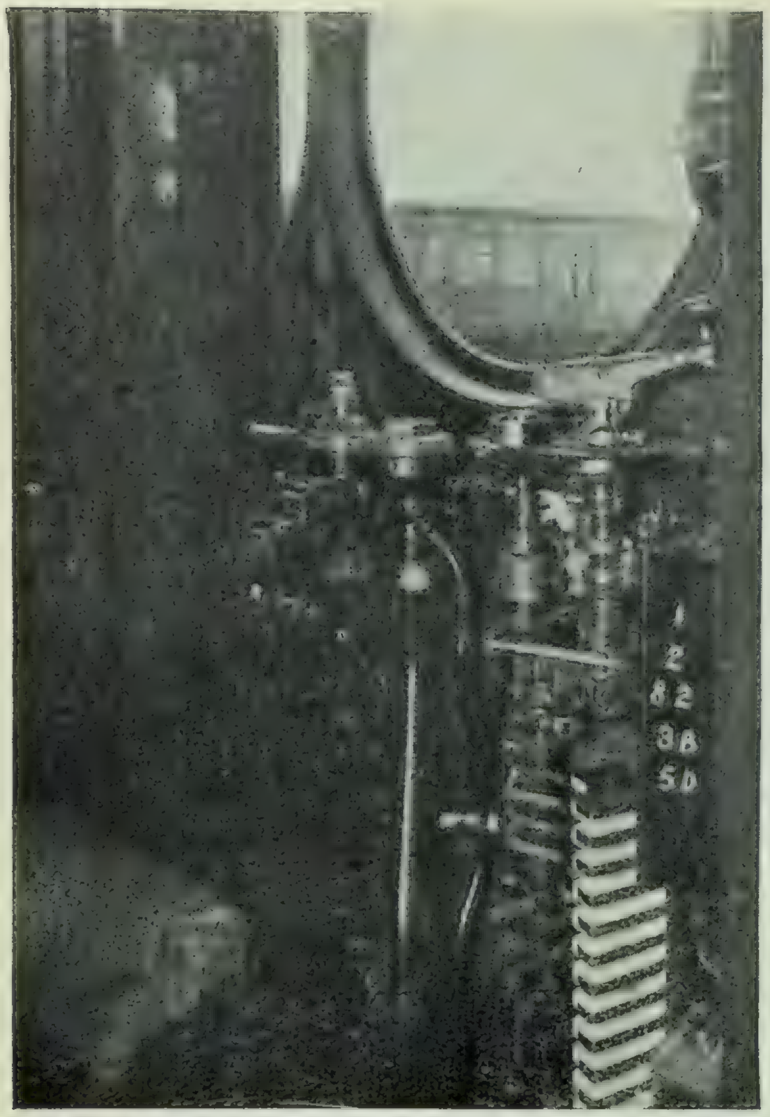
With the coming of railway trains, however, a change took place. People started to build their homes a little way out of the shopping streets to be in the clear country air, and as the city spread people went still farther and farther out. This made the roads insufficient to take all the buses and carriages which wanted to move along them, and so the idea of making underground railways for London beneath the busiest streets was developed.

At first steam engines and trains were run in short stretches of tunnels just below the surface of the roads. In these tunnels there were stations and platforms, and an almost perpetual state of fog as the smoke and steam was blown about in clouds by the trains. Travellers groped their ways into and out of the carriages with the help of gas lamps, but when electricity became better known, a new kind of under-the-earth railway was evolved. Instead of the old method of excavating a cutting or channel throughout the whole route to the required level or depth and then roofing it over as was done with the early steam railways, shafts were sunk to an average depth of ninety feet and, with the help of circular cylinders of metal, tube-ways were bored through the solid London clay.

To-day there are more than fifty miles of twin tube tunnels along which it is possible to make long underground journeys, including the longest railway train ride below the surface anywhere in the world—fourteen miles.

The trains which are run in these tubes are smaller than those used for regular surface lines and in many respects unusual. Up on the streets the tube stations are surrounded by shops and, as the passengers enter the stations, plentiful notices guide them to the ticket offices or to automatic ticket-issuing machines, the newest of which also give change at the same time as issuing tickets. Giant electric lifts or constantly moving stairways known as escalators lead the travellers down to the lower parts of each station where the platforms are situated. Further notices and brilliant lights guide and help to make the underground premises cheery, and as the whole of the underground system is supplied with fresh air at a constant temperature the stations are often nicer than the streets above, especially when the weather is wet or foggy.

Small electric trains which fit the circular tubes with but a few inches to spare arrive



Travelling by Underground may be done in perfect safety to-day. Here in the motorman's cabin we see the " Dead Man's Handle," a device which automatically stops the train when the control levers are released.

and depart at intervals of a few minutes, so that time-tables need not be consulted by the travellers, who have never very long to wait. As each train of between three and six carriages roars into the station and comes to a stop, the doors throughout the whole length of the train fly open by sliding apart. They are controlled by the travelling guard who with the motorman or driver is carried on each train. Passengers alight and the travellers on the platform quickly step aboard, the doors are closed and within a few seconds the train is on its way again through the tube to the next station.

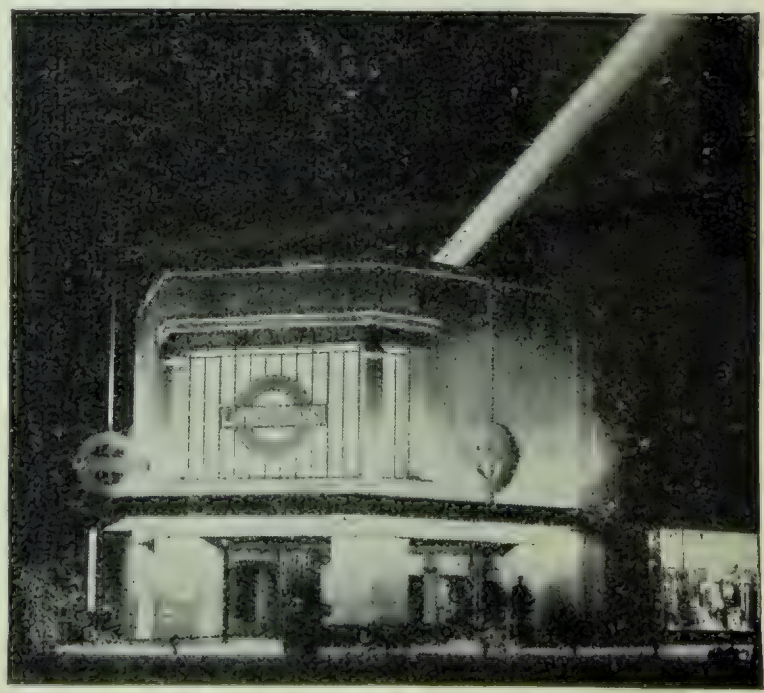
CLOCKWORK BRAINS ASSIST HUMAN INTELLIGENCE.

The trains are driven by motormen who sit in a front compartment looking ahead through the tunnels. By moving a handle notch by notch the speed of the trains is controlled, and air brakes enable the motorman to stop exactly at a given point at the stations. A clever device known as the trip-cock, which consists of a metal arm, rises off the track after the train passes each signal light, which turns to red. This arm would be struck by any train following too closely, shutting off the electric current. As the required distance between trains is kept, however, the trip-cock lowers itself electrically when the red light of the signal turns to green again so that the following train passes along safely. Headway clocks are also fitted at some of the underground stations to show the motormen how many minutes and seconds have passed since the previous train passed along, and by these and other devices a very regular service is kept going. No parcels, mails or luggage are carried on the underground trains except by the passengers themselves.

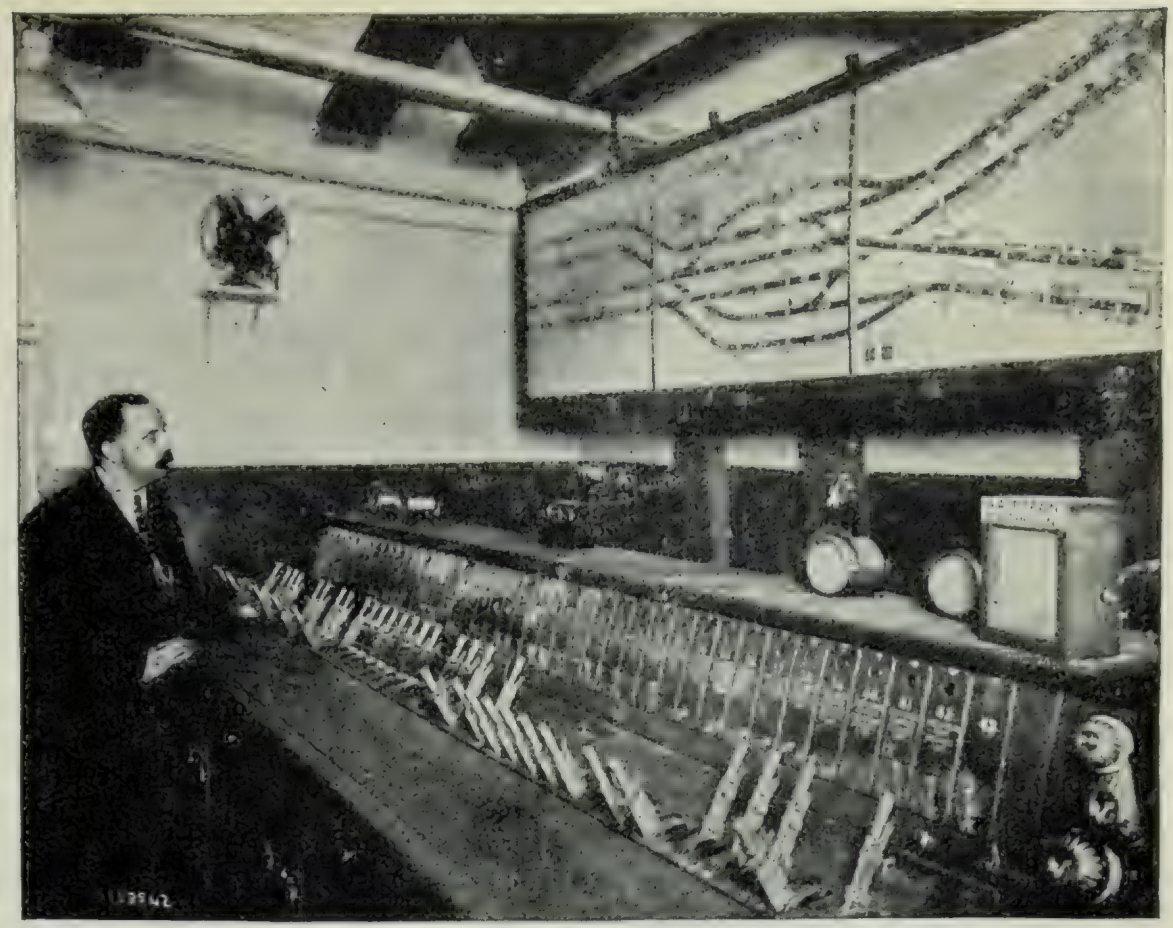
THE SIGNAL DEVICES ARE INGENIOUS AND FOOLPROOF.

A much faster rate of acceleration is possible by electric trains, and the nearness of the tube walls give the effect of travelling at high speeds, but owing to the large number of stops made by the trains the actual average speed of the tube trains is twenty-five miles an hour.

Behind the scenes ingenious signalling control offices help to work the services by electrical indicators, which show by coloured lights exactly where each train is and how it is moving. Working below the ground by these diagrams the signal control men are able to alter the running of the trains to meet sudden rushes or movements of the public. When it rains in the city streets, for instance, or when there is a big football match or aerial display, thousands of people want to use a particular section of the tube routes. The underground signal controllers at these times arrange short shuttle services and keep the trains moving as fast as possible.



A Tube Station by night. The searchlight is used to tell passengers where to find the station. [*Underground*



This signalman at the busy Camden Town junction holds the tube trains under control. A light on the map in front of him shows just where each train is.

Some of the trains run into the open air after they have left the streets behind, and continue their routes out into the suburbs and country. Motor buses connect with these trains and carry business folk to and from their homes in the evening and morning hours. By building what are known as burrowing and fly-over junction tracks along which the trains can run under or over the top of other tracks and trains without fear of collision at any time, the underground services can be switched on to a number of tracks independent of each other at any time. The first tube trains of the morning begin very early, just after five o'clock, and the last trains are run after midnight. Relays of workers are arranged in shifts or links of duty to drive and control the trains over such a long period.

The main source of electricity for the whole of the London Underground system is a giant power station at Lots Road, Chelsea, in London. Heavy cables lead the electric current through all the tubes, and extra rails carry it within reach of the metal shoes which are the contact making points on each train. Sub-stations to stir up the current are needed, and inside these buildings engineers are on the watch all the time the trains are running. Batteries of electric switches surround the inside of the walls of these sub-power stations which must be manned or the services would not be kept running.

PREVENTION IS BETTER THAN CURE! SAFETY IN THE TUBE.

Should a failure of any kind occur in any of the tunnels, the electric current can be cut off instantly by nipping together two bare wires which are stretched a few inches apart in every tube tunnel. In addition, every motorman carries with him a small private telephone which, when clipped on to these wires, allows him to talk immediately with the engineer in the sub-station. As the tube wires are within a few inches of the side of the train the motorman need not leave his compartment to clip up this telephone, but merely open a window and stretch out his arm. A further help in this connection is a telephone which is fitted from one end of each train to the other. Through this the motorman can speak to the guard, whose voice comes out strongly through a loud speaker. The guard can also reply and, if need be, walk through the whole train by means of communicating doors between the carriages.

THE MARVELLOUS INGENUITY OF MODERN INVENTORS IN THIS MECHANICAL AGE.

As with the trains, so with the lifts and moving stairways, mechanical control is used wherever possible to check human control for safety. To guard against any lift being started before the gates are closed a device known as the safety catch is used. This is an electric switch which cannot be closed until the gates of the lift are fast, and when it is open the lift is immovable. A further safety device called the lift governor regulates the speed of the lift as it moves up to the surface or down to the platforms. The lifts are built in pairs in the same large round shaft. If a defect in the mechanism should cause a lift to stop midway an emergency outlet for the passengers thus trapped can be arranged by bringing the adjoining lift to the same level as the disabled one ; a door in the side of each is then opened and the passengers are asked to step from one to the other, to be brought either to the top or bottom landing by the other lift. Engineers then repair the lift which has broken down. Such an occurrence as this, however, is very rare. The newest method of transport on the underground, the escalator or moving stairway, is simple and quite safe, consisting of an endless belt of stairs which move slowly upwards or downwards as required. Should it be necessary to stop these stairs at any time an emergency control can be worked by either the passengers or the staff, by breaking a paper drum and pressing together two wires as in the case of the electric current in the tubes themselves.

THE MIRACLE OF THE GIANT RABBIT-WARRENS UNDER LONDON TOWN.

The working of the London Underground is something of a miracle when it is considered that more than two millions of passengers are carried safely every day and night over ninety-one miles of railway tracks, sixty-two of which are in tunnels. Nearly 2000 signals are used to work the trains, and 2000 carriages are in service. 194 stations are served by the trains, 171 lifts and 85 escalators are in use, 102,000 lamps are kept burning, and 230,000,000 cubic feet of purified air are pumped into the tunnels daily.

At the times of the busiest pressure 40 trains an hour or one every 1½ minutes are run, carrying 20,000 seated and standing passengers, and nearly 800 tons of coal are burned every day to make the electricity needed.

The London Underground system of railways is well managed and often admired by the experts from other countries. Under the streets of New York, Paris, and Berlin there are underground tracks, and it is interesting to think of the ways in which these railways have changed the appearance of the cities.

In 1904, for example, there were green fields to the north-west of London at a place known as Golders Green. An extension of the tube railways was constructed, a rapid and frequent service of trains was run, and now this area has been transformed as if by magic into a populous town with substantial buildings, well-paved streets, gas, water, electricity and other public services. At the present time about 13,000,000 passengers a year are handled at Golders Green Station. Away to the west of London at Ealing, also, the underground railway has more than doubled the population of what was years ago a small town.

LINKING UP THE TOWN AND COUNTRY, ABOVE AND BELOW GROUND.

By providing a speedy, reliable and comfortable means of communicating between all parts of a large city, and by stretching farther afield below the surface, railways have been the means of creating new and attractive suburban towns within easy reach of the centre of the city. There still remains much which could and should be done to help the peoples of cities to live and play far away from their work, at the seaside or in the country air, but it is well to remember that the railways with their trains when they can be run quickly and frequently are, as yet, the very best possible method of transporting masses of people to and from their work places. Under a new plan all the trains, underground and surface lines, tramway cars, and motor buses in London are to be combined together, so that passengers may, with the same tickets, travel whichever way is most convenient.

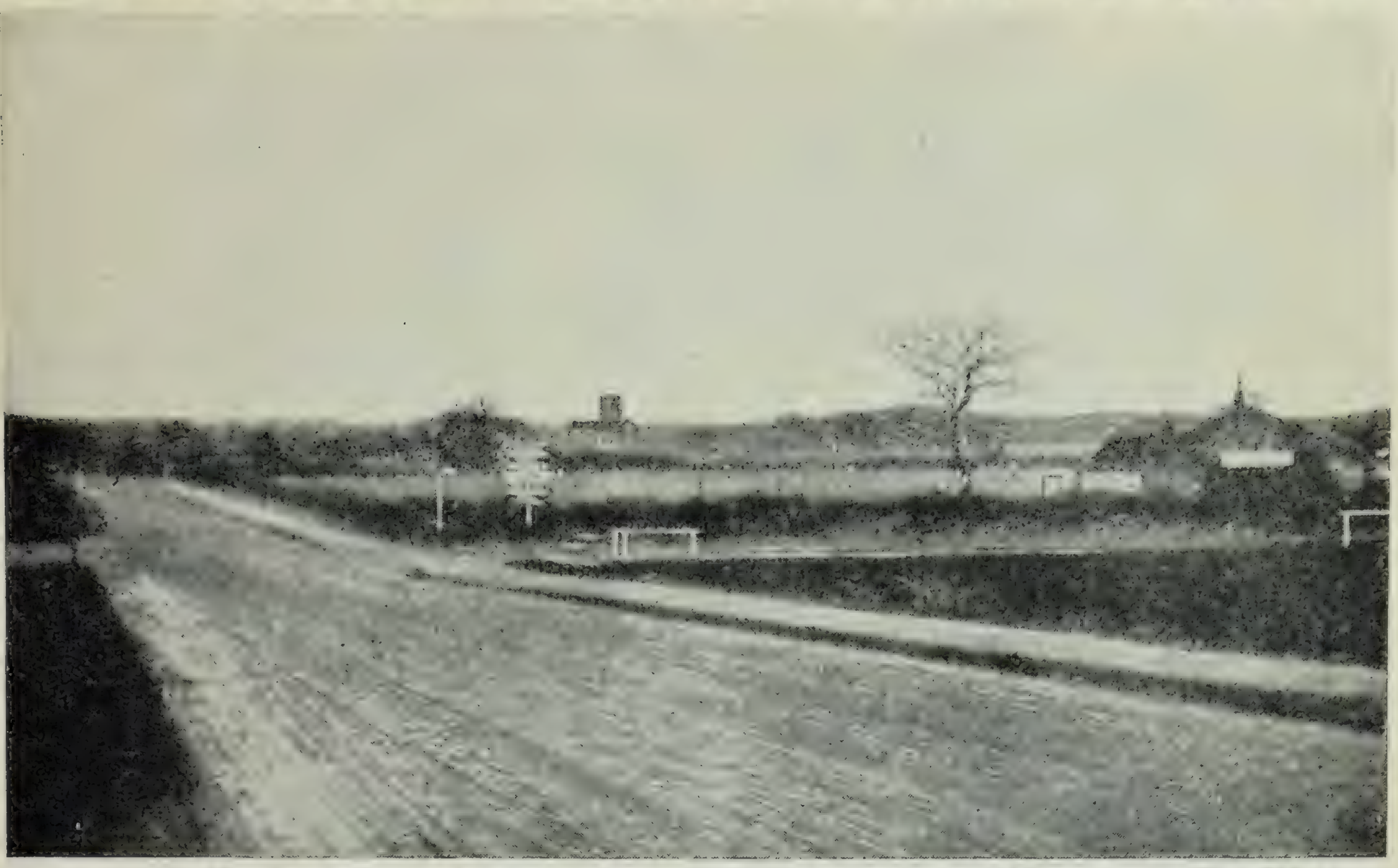
ADVENTURE IN THE HEART OF THE OCEAN

IT is natural to expect that when men longed to be able to sail away across the surface of the seas and oceans they should also wish to penetrate below the surface. A good swimmer can dive and see quite well under water, but after a time breathing rapidly becomes difficult, and some artificial way of supplying air to a man submerged below the surface becomes essential or he will drown.

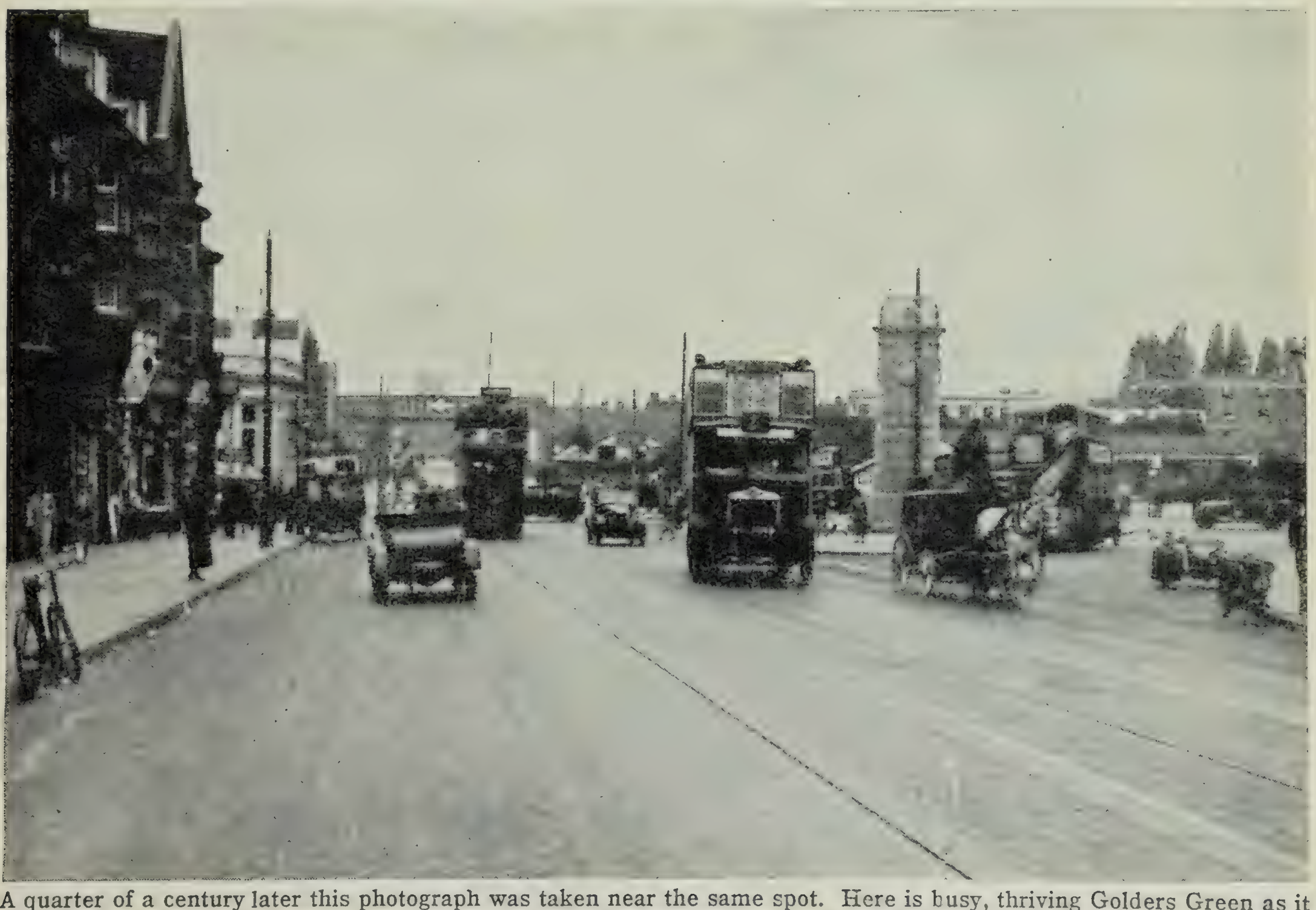
Various kinds of outfits have been invented and are used to allow individuals to penetrate the under-water world. Divers' kits have been improved until a man can now walk along the sea bottom and also work under the sea for as long as an hour or more according to the depth.

With the help of a metal cylinder closed at the top end, or a giant up-turned bucket known as a caisson lowered into water until it touches the bottom, workmen are able with the help of compressed air to dig into the bottom of rivers and arms of the sea to make foundations for bridges, and to scoop away large quantities of earth and rocks from under the water. Recently, also, a scientist has been safely lowered down into the ocean depths to below 2200 feet from the surface off the island of Bermuda, farther than any living man or woman has ever been before, by means of a hollow, thick steel ball known as the "Bathysphere." Through a sealed window he looked out into the darkest depths which were lighted up by a penetrating searchlight carried on the metal sphere. He was even able to talk through a telephone to people on the vessel on the surface from which he was lowered, and also by the miracle of wireless to tell hundreds of

CAN A RAILWAY TEACH A TOWN TO GROW?



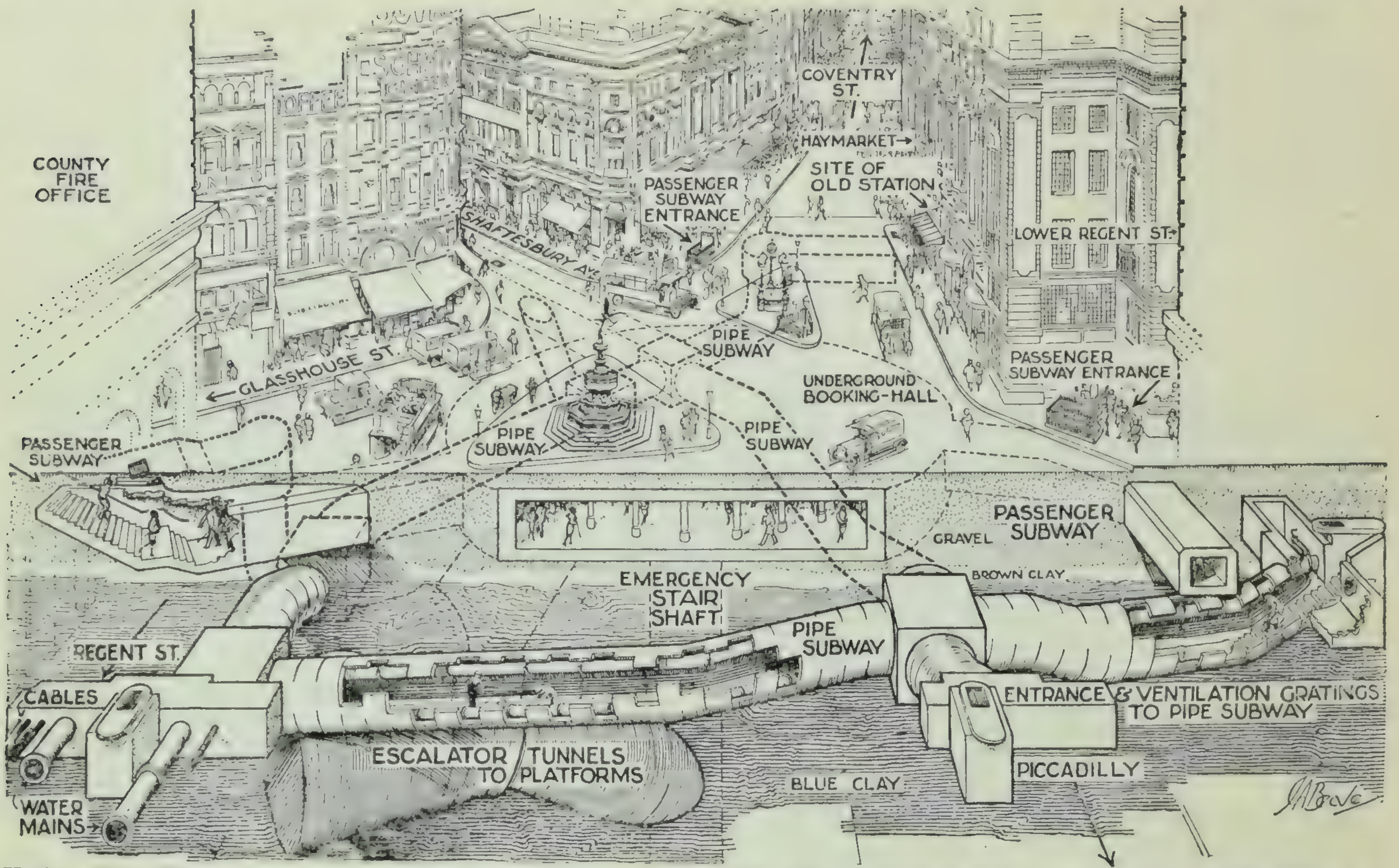
Any one standing by the signpost in the picture above, about thirty years ago, would have thought himself far from the din and rush of a city. He would never have dreamt that one day a large residential suburb of London would grow up, and that the Underground railway would perform the miracle. The view shows Golders Green in 1905.



A quarter of a century later this photograph was taken near the same spot. Here is busy, thriving Golders Green as it was a year or two ago. London's vast populace must live somewhere, and so the city encroaches on the countryside. The Underground Railway ran out lines to Golders Green. People saw they could build houses there and still get to the City quickly and in comfort. So the Underground made a new suburb for London.

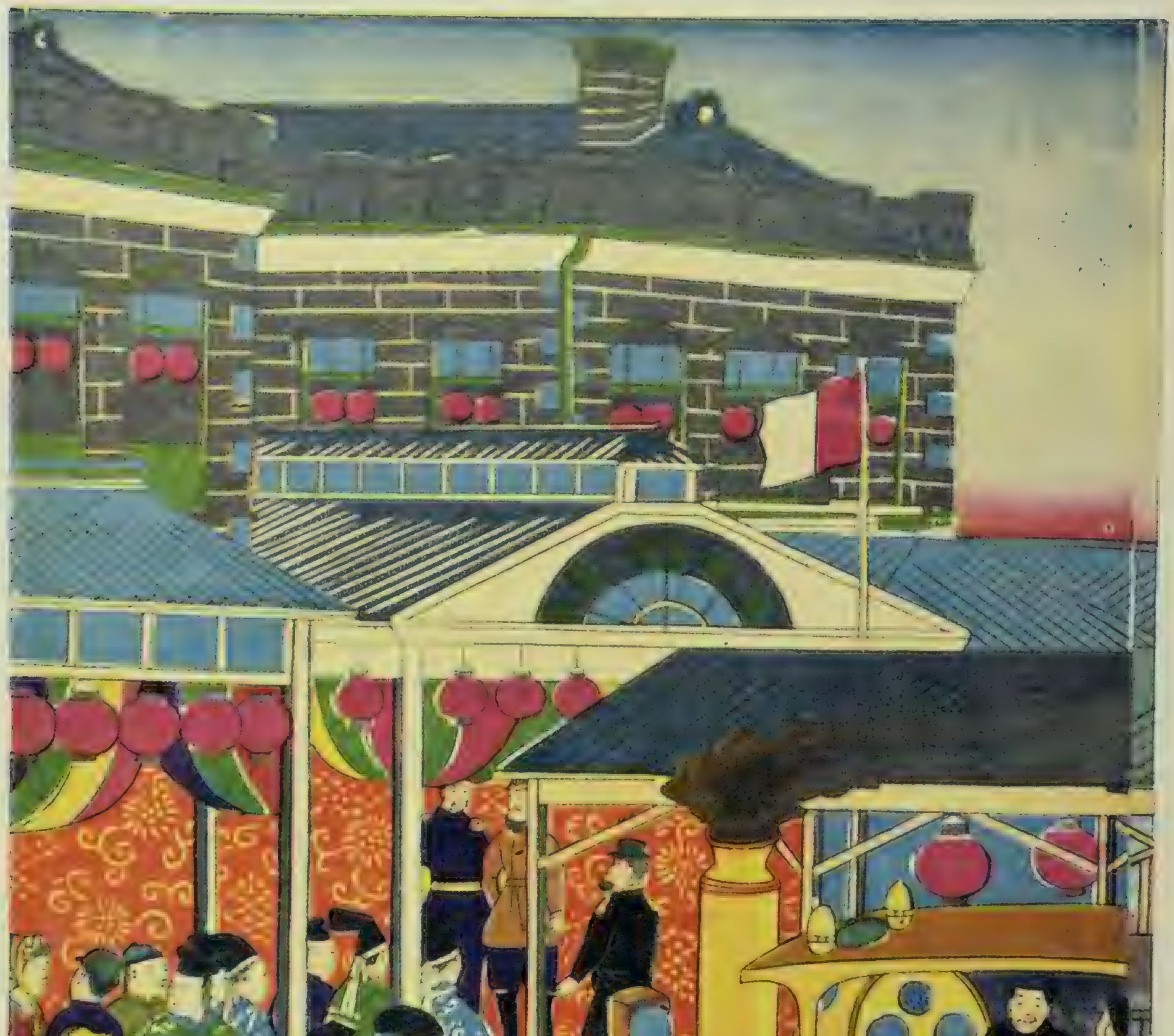
[The photographs on this and the following three pages are reproduced by courtesy of the Underground.

MOLES CANNOT TEACH MUCH TO THE TUBES


COUNTY FIRE OFFICE
COVENTRY ST.
HAYMARKET→
SITE OF OLD STATION
PASSENGER SUBWAY ENTRANCE
SHAFTESBURY AV.
LOWER REGENT ST.
PIPE SUBWAY
←GLASSHOUSE ST.
UNDERGROUND BOOKING-HALL
PASSENGER SUBWAY ENTRANCE
PASSENGER SUBWAY
PIPE SUBWAY
PIPE SUBWAY
PASSENGER SUBWAY
GRAVEL
BROWN CLAY
EMERGENCY STAIR SHAFT
PIPE SUBWAY
REGENT ST.
CABLES
ENTRANCE & VENTILATION GRATINGS TO PIPE SUBWAY
ESCALATOR TUNNELS TO PLATFORMS
BLUE CLAY
PICCADILLY
WATER MAINS

Under Piccadilly Circus, in the heart of busy London, has been made a wonder-station for the "Underground." It is like a town under the street, with a fine arcade of shops. Here we see a diagram showing how the engineers carried out this marvellous feat. The Underground trains are able to keep to time without delay from snow or fog.

The subways to the trains are well lighted and roomy. It is almost impossible to go wrong, for at every turn notices, coloured lights and other devices act as signposts, guiding the passenger to the train he seeks. There is very little waiting when once on the proper platform, for on the chief tracks there are 40 trains per hour! All of them are carefully timed and prevented by ingenious electrical devices from running into each other, so that travelling underground is really very much safer than travelling among the cars and 'buses on the upper surface of the earth!



OPENING THE FIRST JAPANESE RAILWAY.

To-day, railway-trains have penetrated to almost every corner of the world, and this picture, in Japanese style, shows the opening of the first railway in Japan. The Europeans in the foreground have been depicted as seen through a foreigner's eye, and the whole scene, so different from that of our own railway-stations, is full of picturesque colour effects.

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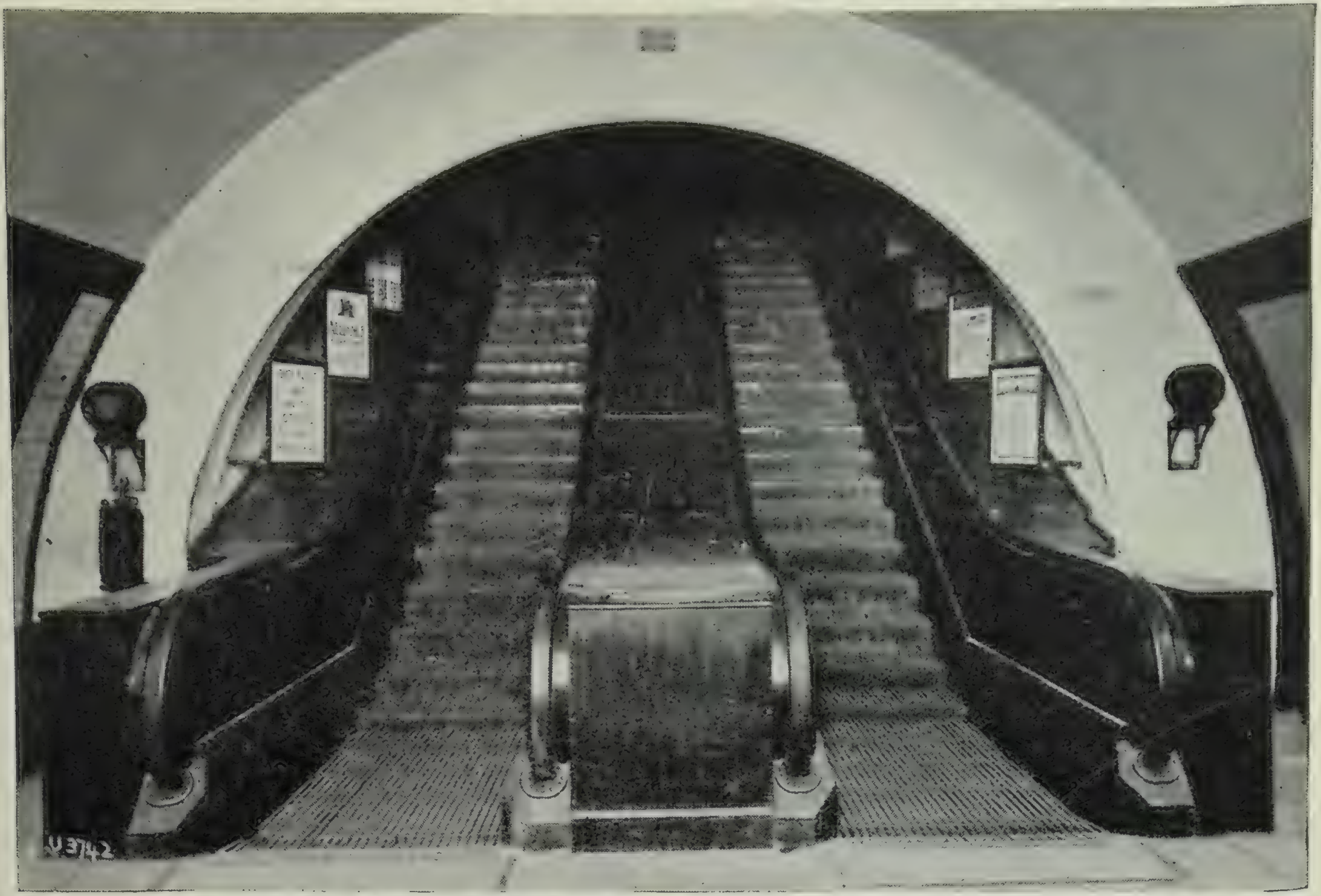
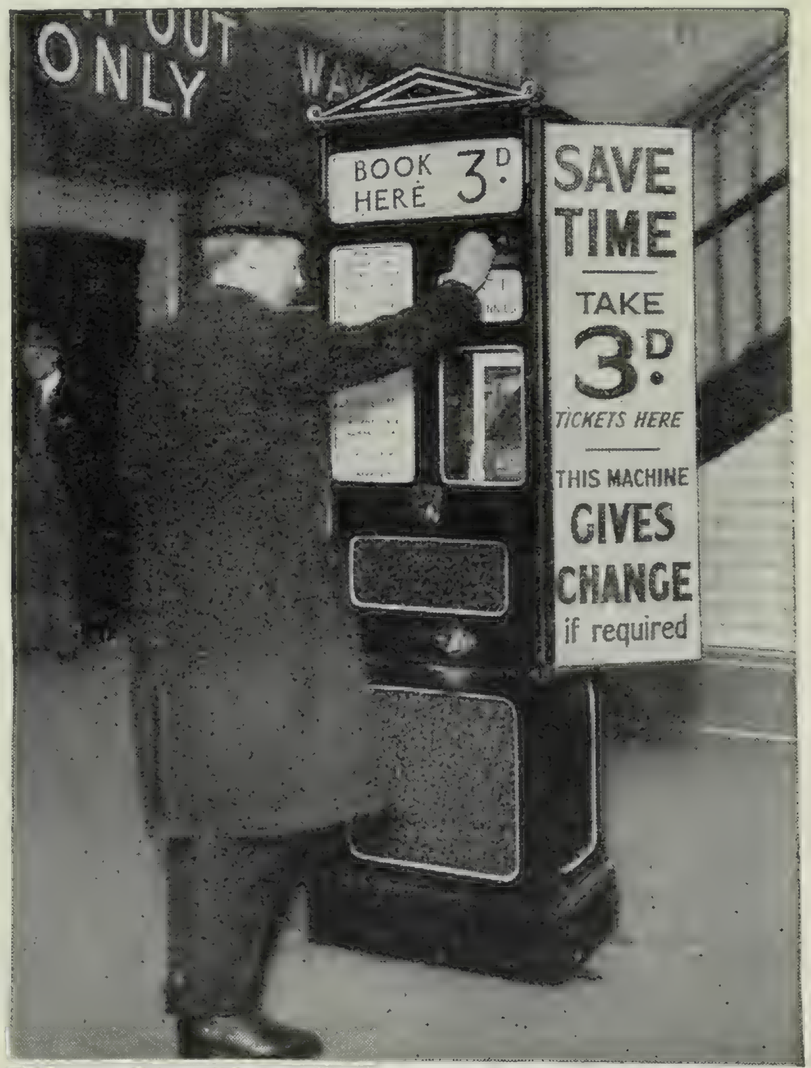
Facing page 117

NO WORRY, NO WAITING, NO EFFORT NEEDED



You move on, if too tired to walk, on the Underground escalators or moving staircases. The one on the left goes upward and the other comes down. Escalators work on an endless chain and as the steps reach the end they flatten out and disappear. Then they travel under the floor to come up again at the other end as steps again.

Notice the great length of this staircase. If you wished to climb it you would be glad it was an escalator.


ONLY
WAY
BOOK HERE 3D
SAVE TIME
TAKE 3D
TICKETS HERE
THIS MACHINE GIVES CHANGE if required

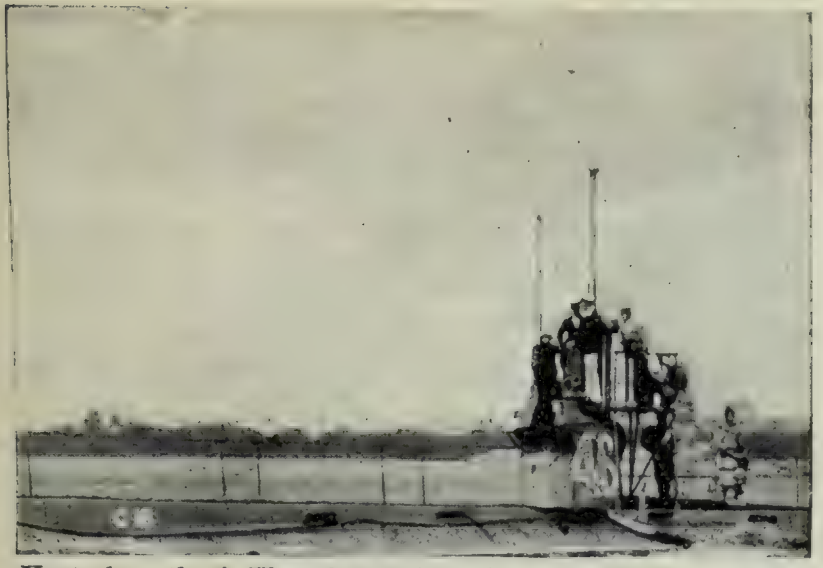
This machine thinks. It gives you a ticket, and if you put in a shilling, ninepence change tinkles into the slot below.

EFFICIENCY AND LUXURY IN CITY TRAVEL

This modern Underground coach has automatic sliding doors made of metal. The doors open and close as if by magic at each station. They are controlled by the guard, and should they close on an unwary passenger they stop, and cannot crush him. A pneumatic device stops the closing action if the doors meet with any obstacle.

These two photographs and the two below show how comfortable and spacious are the cars on London's Underground. The seats are padded and upholstered, while the central passage is wide and allows for strap-hanging passengers in " rush " periods. The doors are wide and allow passengers to enter and alight with the minimum of delay.

The Underground carries about two million passengers every day—all in safety and comfort, thanks to the many devices clever minds have evolved for assisting passengers and guaranteeing the safe running of the trains. Purified air is constantly pumped into the tunnels and all stations, escalators, cars and subways are brilliantly lighted.



Up to breathe ! Here is a submarine showing the conning tower with its periscopes—that are its eyes above the water.

thousands of people just what he was looking at from moment to moment.

But none of these under-water devices are free to sail along and move to the surface or dive down and remain submerged as long as desired. Such a freedom and power needs a ship which will be equally at home on the surface or under the water. Such a vessel is called a submarine, and although wonderful below-the-surface ships have been built they have nearly all been constructed for evil purposes. Great secrecy shrouds their movements, and they are fitted with such death-dealing devices as torpedoes or mechanical metal fish which will explode and wreck surface vessels when they are fired from the submarine, often from below the water level.

THE SILENT SCOUT THAT GLIDES UNSEEN BELOW THE WAVES.

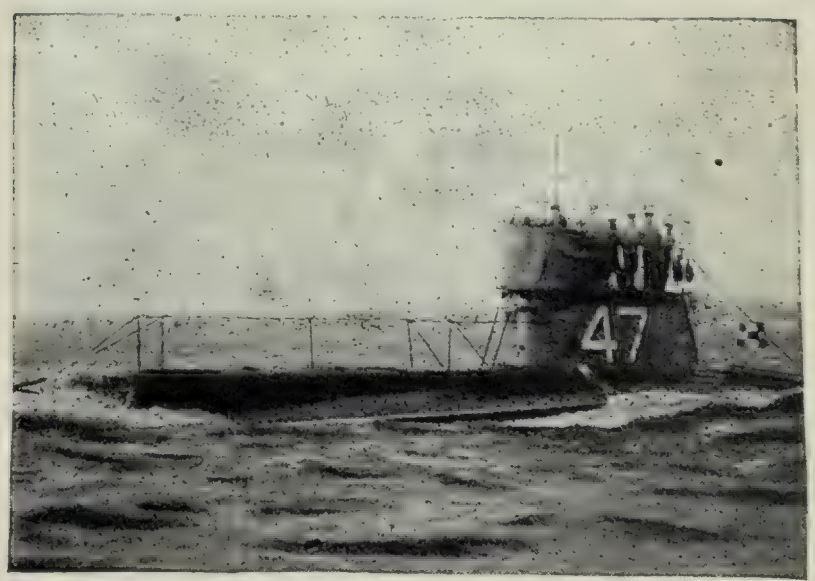
Experimental submarines were built as long ago as 1864, when an American vessel, *Housatonic,* blockading Charleston in the Civil War, was sunk by a primitive submarine. But it was not until 1901 that submarines were introduced into the British Navy. The German Navy evolved some remarkable under-water craft of this type, and while at first they directed their explosives towards warships, later in the Great War merchant vessels were sunk indiscriminately. In 1917 no less than 2639 merchant ships were destroyed in this way by submarines which were able to cruise completely submerged, only a slender hollow periscope or eye-piece being visible above water.

Submarines are constructed with double hulls. Inside the inner hull are the engines, stores of torpedoes, cramped quarters for the crew, and between this and the outer hull there is a series of water ballast tanks which can be filled or pumped empty at will. When they are empty the buoyancy makes the vessel rise to the surface, and as they are filled the whole structure is submerged the exact depth to which the submerging movement is carried, being governed by the amount of water allowed to enter into the water tanks.

Above the rounded hull there is a tower and a small platform on to which the crew can climb when the vessel is sailing on the surface. On the platform there is frequently a gun, and sticking up from the conning tower is the all-important periscope which contains mirrors carefully arranged so as to give an exact view inside even when the gun, platform and tower are submerged. For cruising on the surface motors are made to drive screw propellers, but when cruising under water electric motors are used, supplied by current from electric batteries which are carried on the submarine.

SUBMARINES THAT FACE UNKNOWN PERILS IN THE DEEP WATERS.

On the surface a submarine can travel at seventeen or twenty knots, but when submerged the speed is only about one-third of this, and when the periscope is also submerged and the vessel sailing blindly progress is even slower. Naturally, a submarine stays on the surface as long as possible, but the newest submarine which is a French monster called after a brave pirate captain, Surcouf, is 394 feet in length, and displaces 4300 tons when submerged. This vessel is armed with eight-inch guns, and has fourteen torpedo tubes which can all fire simultaneously if the occasion should arise. Enough fuel is carried for a 12,000 mile cruise on the surface at a steady speed and sufficient air and electricity are also carried, so that the submarine may remain under water for no less than sixty hours at a stretch. This gigantic submarine has just completed a successful cruise of some thousands of miles from Cherbourg.



The submarine is here seen cruising on the surface, while some members of the crew come up for an airing.

But it should not be thought that because submarines are usually built for destructive purposes they are not manned by brave or clever men. During the Great War and since great bravery and pluck has been displayed by the crews of these under-water craft, who take their lives in their hands every time the order to submerge is given. On one occasion a submarine could not rise to the surface, and the crew were shot out one by one to the surface through the torpedo tubes. Through the coolness and courage of a young officer several men were thus saved.

At least one submarine, the *Nautilus*, has been used for scientific purposes. This vessel, which was fitted out in America, was commanded by Sir Hubert Wilkins, who thought out the idea of travelling by submarine under the Arctic ice which extends for many miles around the North Pole. After a rather disastrous voyage across the Atlantic the *Nautilus* reached Norway and set off for the farthest north. Mishaps occurred, and regretfully the scientist and his crew had to return to Norwegian waters where the project was abandoned. The *Nautilus* had to be abandoned, and was allowed to sink after everyone and everything had been removed.

QUEER METHODS OF TRAVEL AND TRANSPORT

APART from the more regular modes of travel to-day by rail, road, steamship or air, man has evolved through the ages various ingenious methods of transport to haul both people and packages from place to place. All kinds of animals have been made to play their part in helping locomotion.

In Norway, the land of the Midnight Sun, the motor car is not nearly so popular with the villagers as the stolkjærre. The stolkjærre is an old wooden trap without springs, mounted on two wheels, which is drawn by a Norwegian horse or pony. The driver sits on the back seat when he is conveying people from one spot to another, and holds the reins between the two persons who sit in front of him. The journey is naturally very slow, because Norway is a hilly country, but a passenger in a stolkjærre would not relish a quicker one, as he would be jolted about too much.

These stately monarchs of the desert, striding so calmly over the sands, act as luggage-bearers for the natives.

A similar type of vehicle is peculiar to Ireland. The jaunting-car is a well-known Irish conveyance mounted on two wheels, containing a length-wise seat on each side, and a seat in front for the driver. Passengers travel for miles in these jaunting-cars, and seem to enjoy it too.

HAVE YOU EVER SEEN A HANSOM CAB WITH ITS DRIVER PERCHED BEHIND?

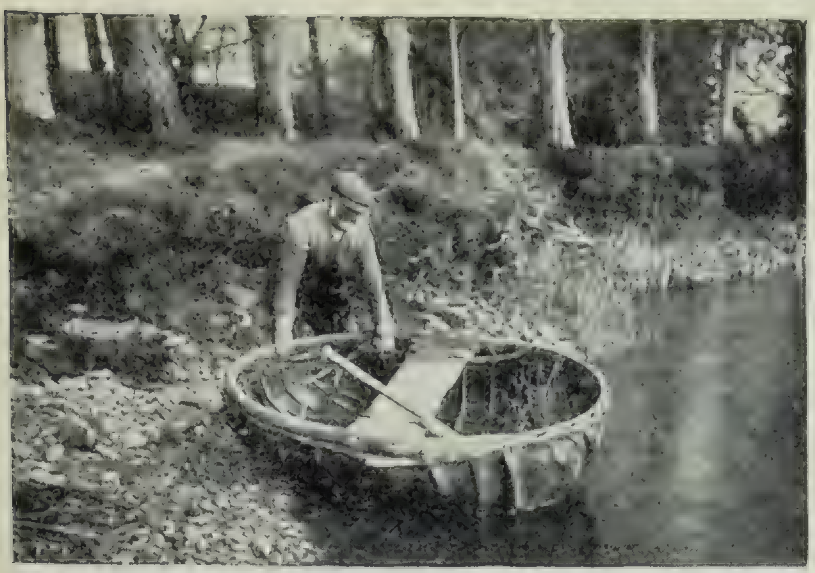
One or two hansom cabs may still be seen on the London streets, but these seem very queer to us to-day. The driver sits behind his passengers and is able to speak to them through a small aperture made for the purpose in the roof. The front of the cab is open, with the exception of two small doors closing together to cover the legs of the occupants. To-day a hansom ride is usually treated as a joke, although, on wet and stormy nights, people are glad to use them in order that they may reach their destinations in a perfectly dry condition.

In the eastern hemisphere, however, a more primitive form of transport exists still. In China and Japan, rickshaws are commonly used, though to-day, in the larger cities, motor cars are gradually taking their place. These two-wheeled vehicles with shafts are drawn by men who are called " coolies." The coolies run quite swiftly with their carriages. In Japan the rickshaw goes by the name of " jinrikisha " or " man-pulling carriage."

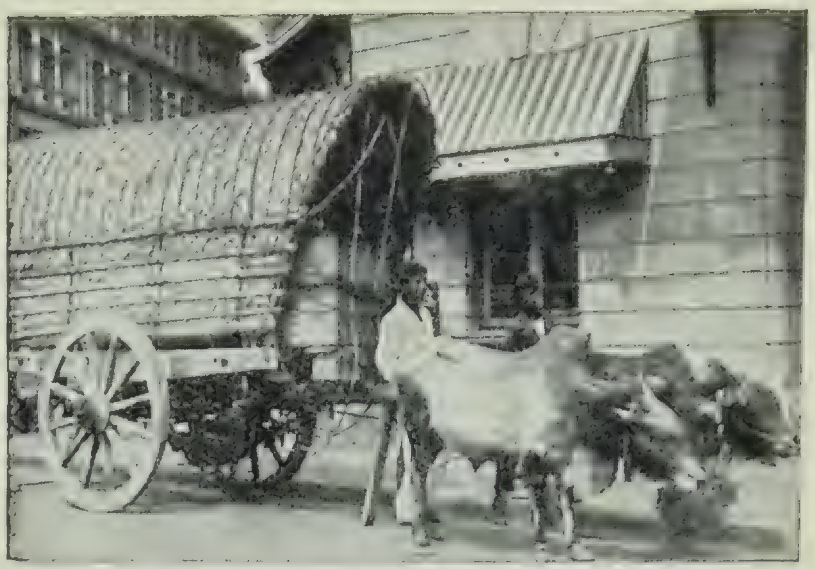
THE USEFULNESS OF DOGS IN THE LOW COUNTRIES AND THE FROZEN NORTH.

Dogs are used for traction purposes in Switzerland, Belgium and one or two other countries. These animals have to be specially trained for their duties, which include the haulage of milk carts, vegetable carts, bread vans and even laundry and rag and bone

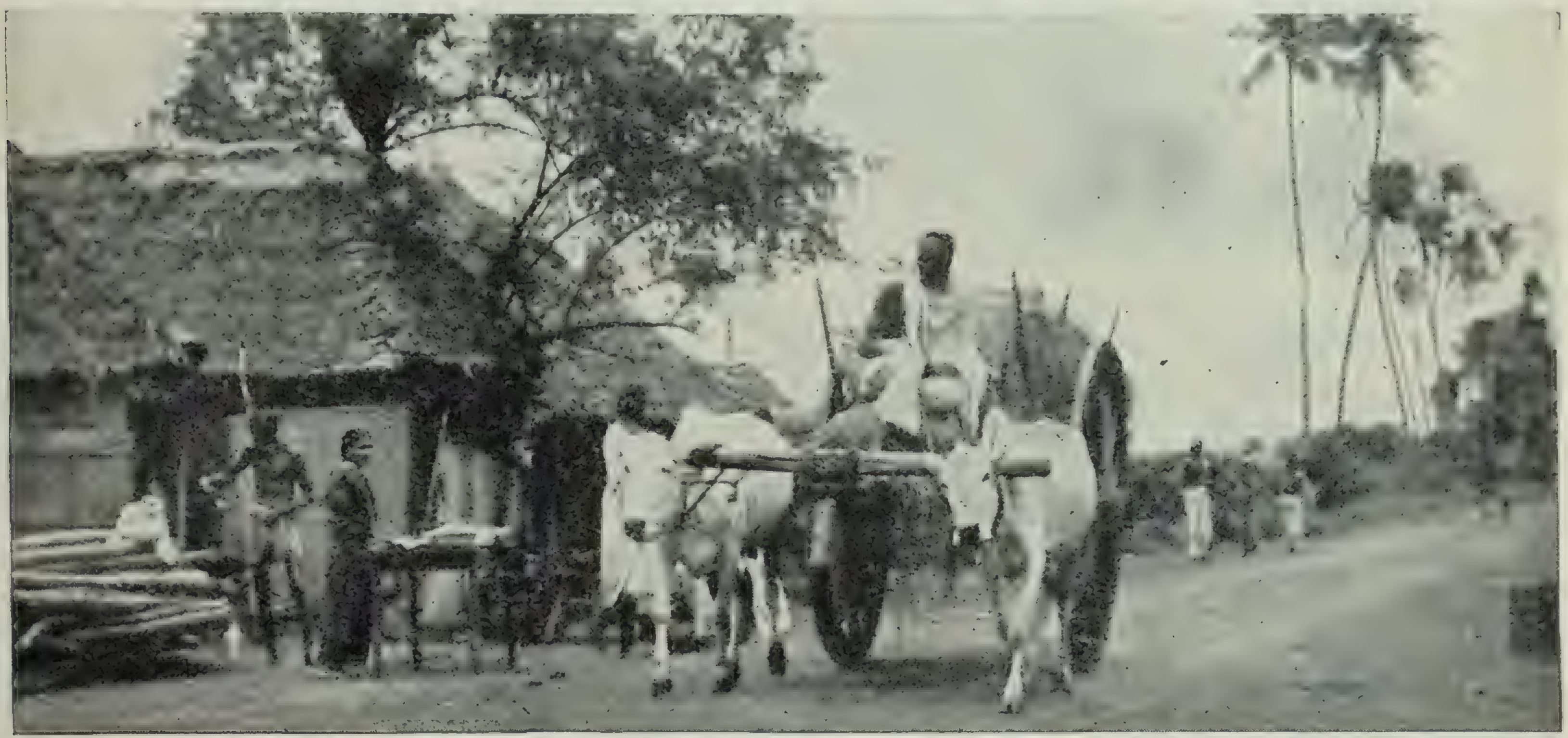
LEISURELY METHODS OF MOVING ALONG



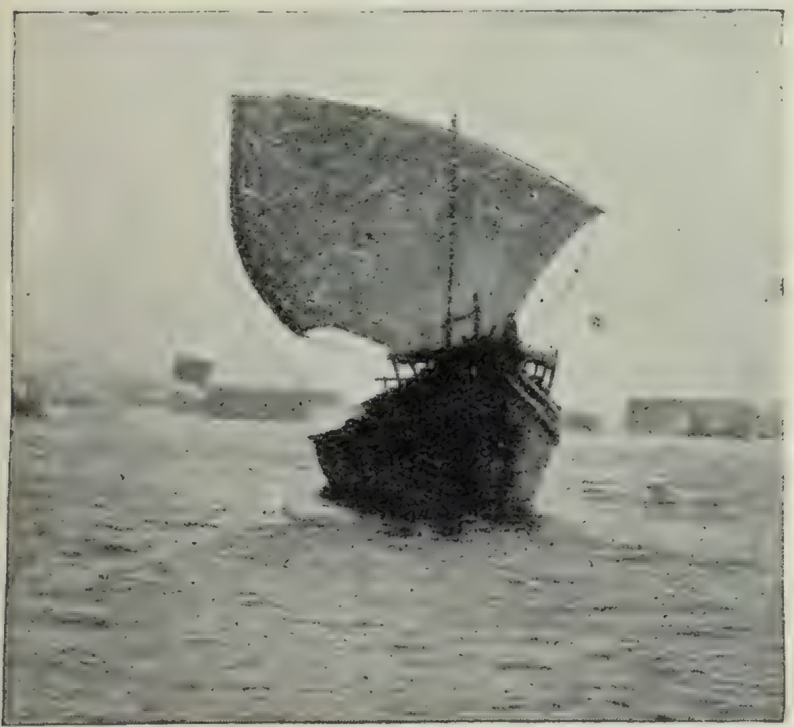
In a quiet spot in England we find the people still using this primitive type of water-craft seen above. These light coracles can be carried quite easily down to the riverside.

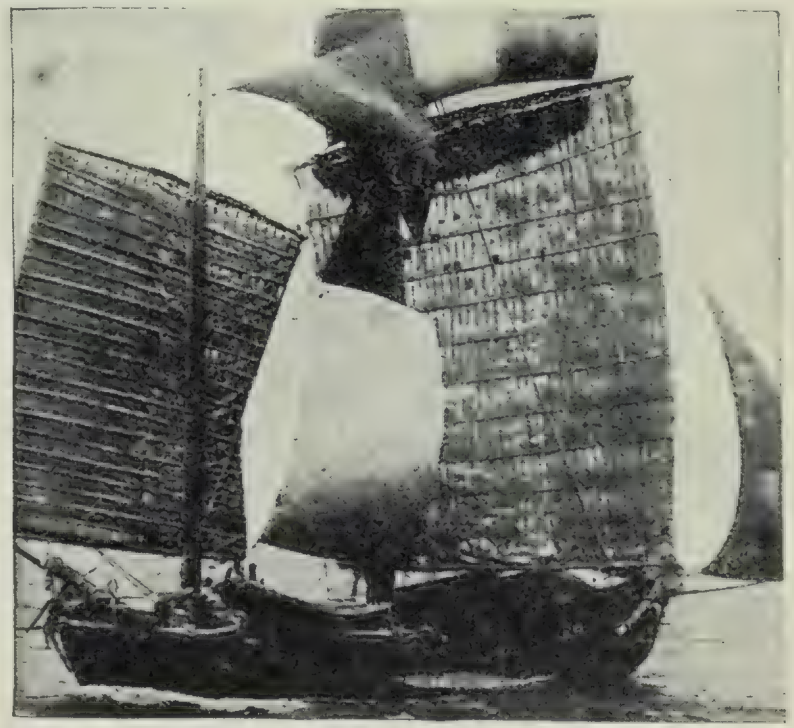


This covered wagon with its dusky driver and docile pair of animals has come to a halt. How can you tell, from the shadows cast, that the sun is almost directly overhead?

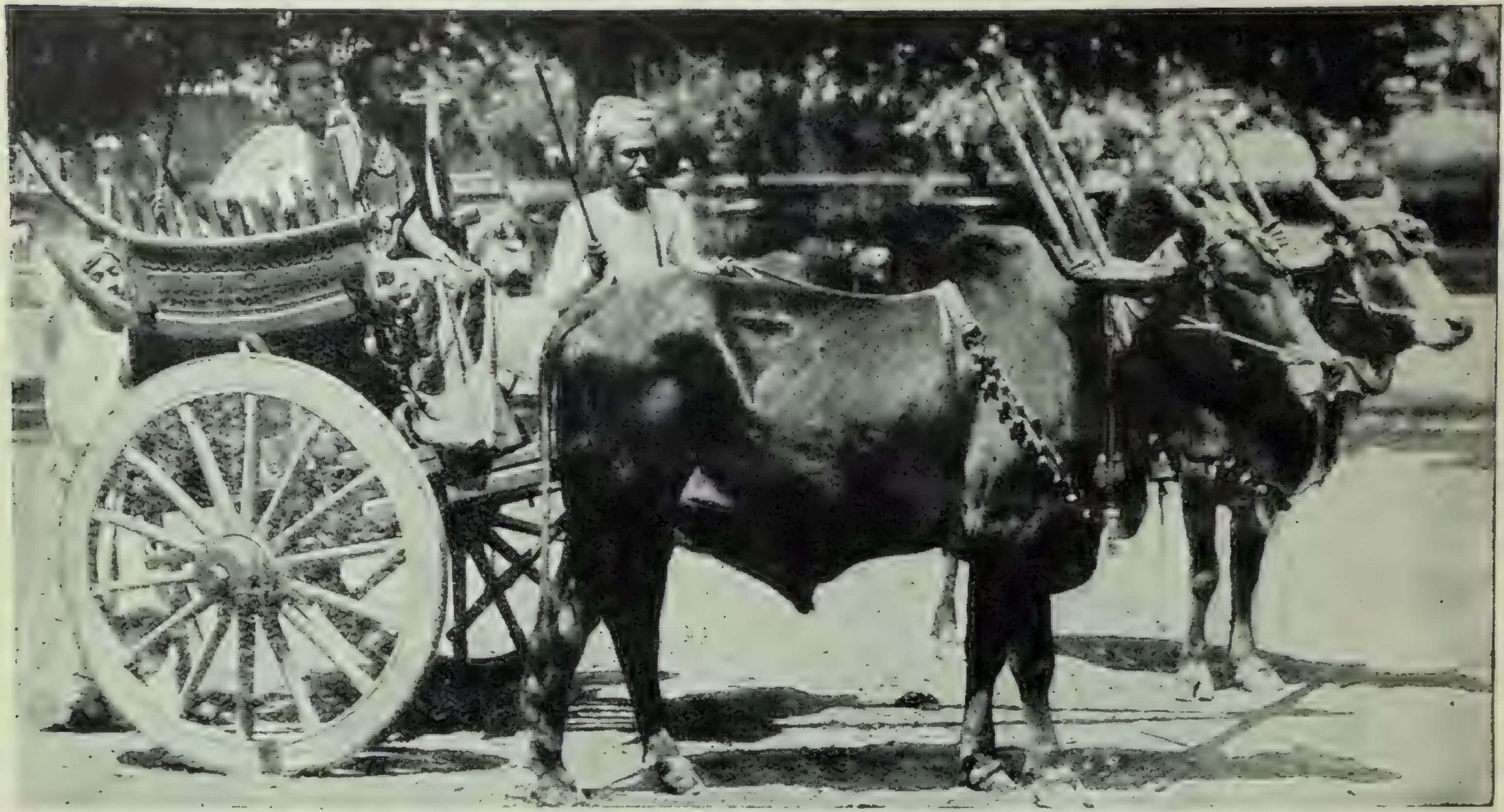


No one hurries in the fragrant isle of Ceylon, where the sun is always blazing. In this land of spices, which is one of the beauty spots of the world, the natives find slow-moving oxen-carts most suitable for transport. Here we see two of these patient beasts, moving peacefully along under their heavy yokes, while dark-skinned natives look on.





On the Hugli, in India, we find the unusual type of craft seen in the picture to the left. Note how the wide sail billows out in the wind. The Chinese boat on the right, with its peculiar sails, is called a Junk. It is one of the quaintest boats to be seen gliding over the waters. Observe the ribbed sails.



When the young maidens of Mandalay wish to go on a jaunt, they yoke their oxen to a lumbering cart, like the one in the picture, and jog heavily on their way, enjoying this "slow but sure" method of travelling in the bright sunshine.

merchants' carts. The dogs are exceptionally strong, and the police in the various countries concerned make certain that no owner is cruel to his dogs. Usually two dogs are harnessed to a small cart in much the same way as horses, but sometimes one dog alone is utilised, and he has to walk underneath the cart he is propelling forward.

When Arctic and Antarctic expeditions are in progress, dog teams are used mainly to draw the sledges over the snow and ice. These dogs are very brave, faithful and sagacious, and have to be trained specially for their difficult tasks.

In the villages situated amongst the beautiful mountains of the Austrian Tyrol, and in the Dolomite region of Northern Italy, oxen are used to draw the primitive farm carts along the rough tracks which lead over the hills and link up the farmhouses with the main road and civilisation. These certainly remind us that the ox was more used as a beast of burden than the horse many hundreds of years ago.

HOW ELEPHANTS, REINDEER—EVEN BIRDS—MAY BECOME MEANS OF TRANSPORT.

Amongst the jungles of Africa and India it is impossible to use any mechanical means of locomotion, so elephants are made to work for man in that capacity. Railed, canopied seats are fitted on to the backs of elephants for conveying people in, and these are known as howdahs. A similar seat is also fitted on to the backs of camels in the deserts.

Most of us know all about reindeer-drawn and horse-drawn sleighs which convey people across great tracts of snow, but we should probably think it very amusing to see an ostrich pulling a light carriage with a passenger in it. Such may be seen, however, in South Africa, where there are large ostrich farms.

QUEER EXPERIMENTS THAT ARE BEING MADE ON GERMAN RAILWAYS.

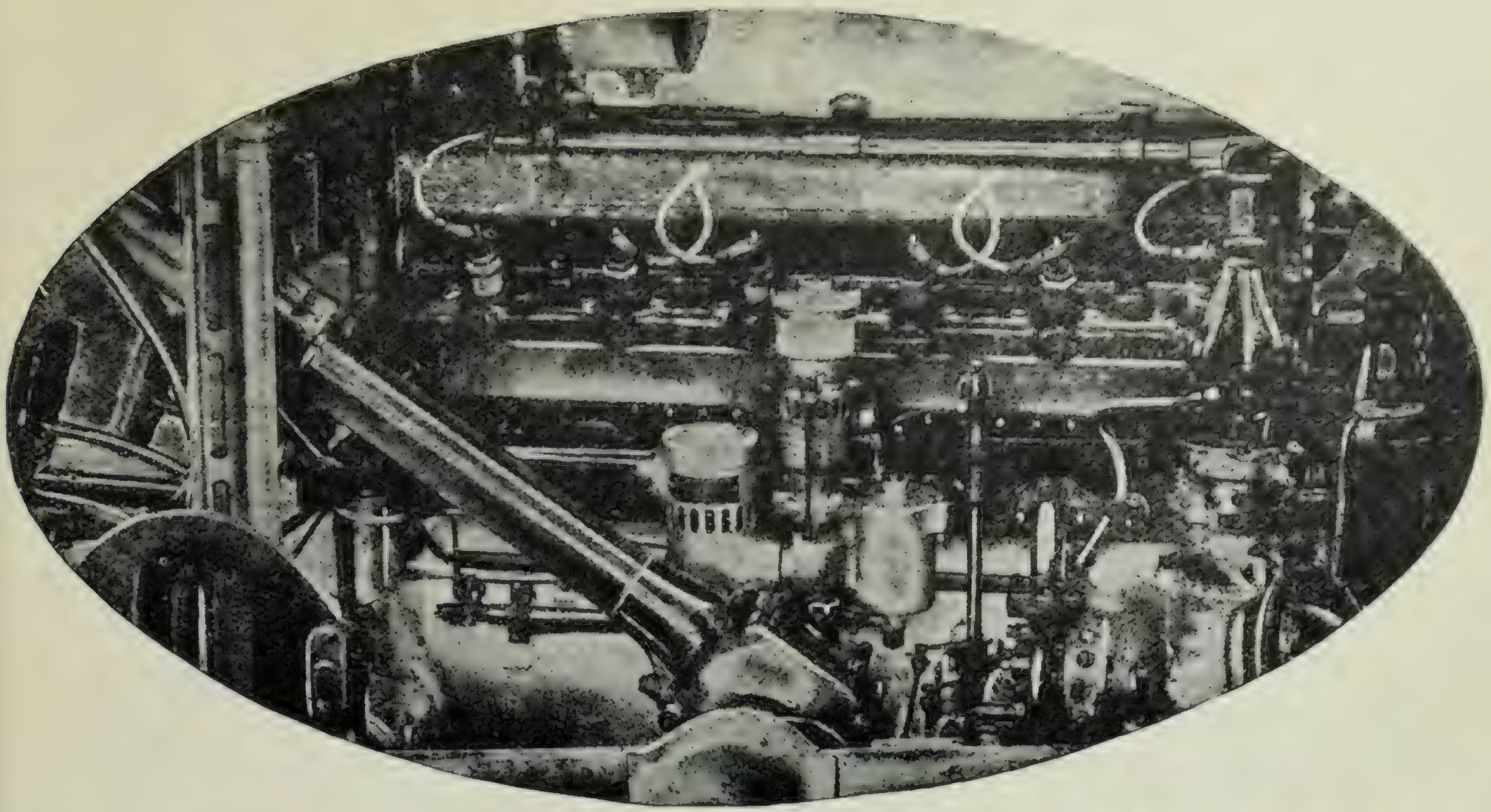
Queer methods of locomotion are not always ancient. In Germany, the very latest train is known as the Zeppelin train, and this is most revolutionary in design. It is shaped like a Zeppelin, the ends of the carriage being pointed, and it attains very high speeds.

At Elberfeld, in Germany, near the famous city of Cologne, there is a curious aerial railway which runs over a stream in this industrial district. The cars are rather like boats hanging from a strong cable which is supported by steel girders over the river. Thus the workmen sail over the river every day instead of upon it.

Later in this book a British invention known as the Railplane is described and pictured.

A marvellous aeroplane which really looks like a bird in flight is one of the most recent queer methods of locomotion. This is known as the Pterodactyl and has been seen at the R.A.F. Pageant at Hendon.

By mounting an ordinary pedal cycle on a specially designed set of floats another queer vehicle has been evolved. By this means a man can pedal his way across water, but this naturally is no mean test of his endurance.



LET'S LOOK AT THE WORKS

Round about us in the home are various products of man's inventive power. The light and heat, the cleaning apparatus, the music—even the bell that announces the arrival of a visitor—all these are operated by skilfully contrived "works." In one book it is impossible to include all the many aids to labour-saving, comfort or enjoyment in the home. So some of the ordinary things have been taken first—things you may be able to examine for yourself. The gas meter and the electric bell are explained, and there are diagrams to help you to understand their working. The hot water system and mother's vacuum cleaner are shown, while the method of keeping food icy cold without ice is set down in detail. The player piano is then, as it were, taken to pieces so that you can inspect it.

COAL when heated without contact with the air turns into a solid residue known as coke and gives off several substances the principal of which is gas. After treatment this gas is supplied into houses by pipes, and to check the amount of gas used by each home a measure or gas meter is fitted so that all gas supplied passes through it.

Not unlike a large biscuit tin painted red, a gas meter consists of two main parts, double bellows made of Persian sheepskins which are contained in a lower section, and an upper chamber which houses a number of cogs and delicately balanced gears. On either side of the meter near the top are inlet and outlet tubes, which are connected with the main supply pipes

As the gas flows down the inlet pipe it passes into one of the bellows, filling it out. Outside the bellows is a disc connected to a flag arm which works the cogs in the upper chamber and closes a valve as soon as one bellows is full of gas. The incoming gas then passes into the second bellows, and the gas which has been measured, *i.e.*, that in the first section, passes on to the outlet pipe. By this alternate filling and exhausting of the bellows a steady stream of gas can pass through the meter, but when it does so the cogs and gear wheels revolve. By connecting these wheels with a number of dials like little clock faces, numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a single pointer on each dial registers up to 9,000,000 cubic feet of gas as it passes through the meter, after which the dial pointers go back to nought and register all over again. The simple adjustment of a pin enables the meter to be adjusted accurately to compare with a standard meter.

To read a gas meter it will be noticed that there are four dials in a row with a tiny test dial above them. This test dial indicates single cubic feet only, and if all the taps and burners in the house are turned off, any movement of this pointer will show an escape of gas. By the same means the hourly use of gas through a stove or gas fire can readily be obtained.

The four dials should be read from left to right. On a piece of paper write down the smaller of the two figures between which each of the hands is standing, unless the hand is between 9 and 0 when 9 should be put down. The first dial represents millions of cubic feet, the next hundreds of thousands of cubic feet per revolution of the pointer around the dial, the next tens of thousands and the last dial thousands. At the end of a week or other period the meter should be read again, and by subtracting the first numbers from those now registering and adding two noughts (00) the number of cubic feet of gas which have passed through the meter is obtained.

But the charges for gas are not now made by the number of cubic feet, instead the heating value is counted in Therms, a therm equalling 100,000 British Thermal Units. The gas which is now supplied is usually so good that it contains 500 of these gas therms to every cubic foot, and to convert the cubic feet of gas shown by the meter as being used all that is necessary is to divide the footage figures by 100,000 and multiply them by 500, or a simpler way is to count 5 therms for every 1000 cubic feet.

Some meters have coin attachments by which the insertion of a coin in a slot allows a certain amount of gas to pass through the meter after which the supply is shut off until another coin is placed into the slot.

WHAT MAKES AN ELECTRIC BELL RING?

NOBODY knows exactly what electricity is, but a good deal is known of what it can do, and when an electric bell push is pressed a bell rings just as long as the push is kept pressed.

It is known that electricity flows along like a current, and that it moves better along certain materials. A copper wire, for instance, is an admirable help to an electric current, and so to make an electric bell ring the bell push is connected up with not only one copper wire, but two which are kept quite separate.

At the other end of the wires is an ordinary bell near which is fixed a tiny hammer mounted on a spring, and an ingenious vibrating device known as a contact breaker. Connected to one of the wires also is an electric battery which contains a little amount of electrical energy ready for adventure. It has either been collected into the battery by being charged at an electrical works, or else chemicals which when placed together develop electrical energy are contained in the battery box.

The two copper wires are carefully arranged behind the bell push so that the ends just do not meet each other, and as the china non-conducting push is pressed the two ends of the wires, or two tiny pieces of brass to which they are connected are made to meet. Instantly electrical energy from the battery leaps along the wire, for an almost complete circuit of metal has been made. Running along one of the wires the energy whips past the contact point behind the bell push and rushes away towards the bell. On reaching the hammer it finds the pathway not so clear and it sets up a small disturbance. This disturbance causes the hammer to strike the bell.

But one single tap of the bell by the hammer would not be very effective, unless the bell was a large one, and the vibrating device or contact breaker is useful in pulling the hammer back from the bell whenever the electrical energy makes it tap or strike it. Thus a distinctive and rapid ting-a-ling-a-ling is given out by even a tiny bell. Some of the electrical energy is lost whenever the bell is rung, but the main part finds its way back along the wire which leads on to the second of the two points on the battery and so tucks itself away again inside the box.

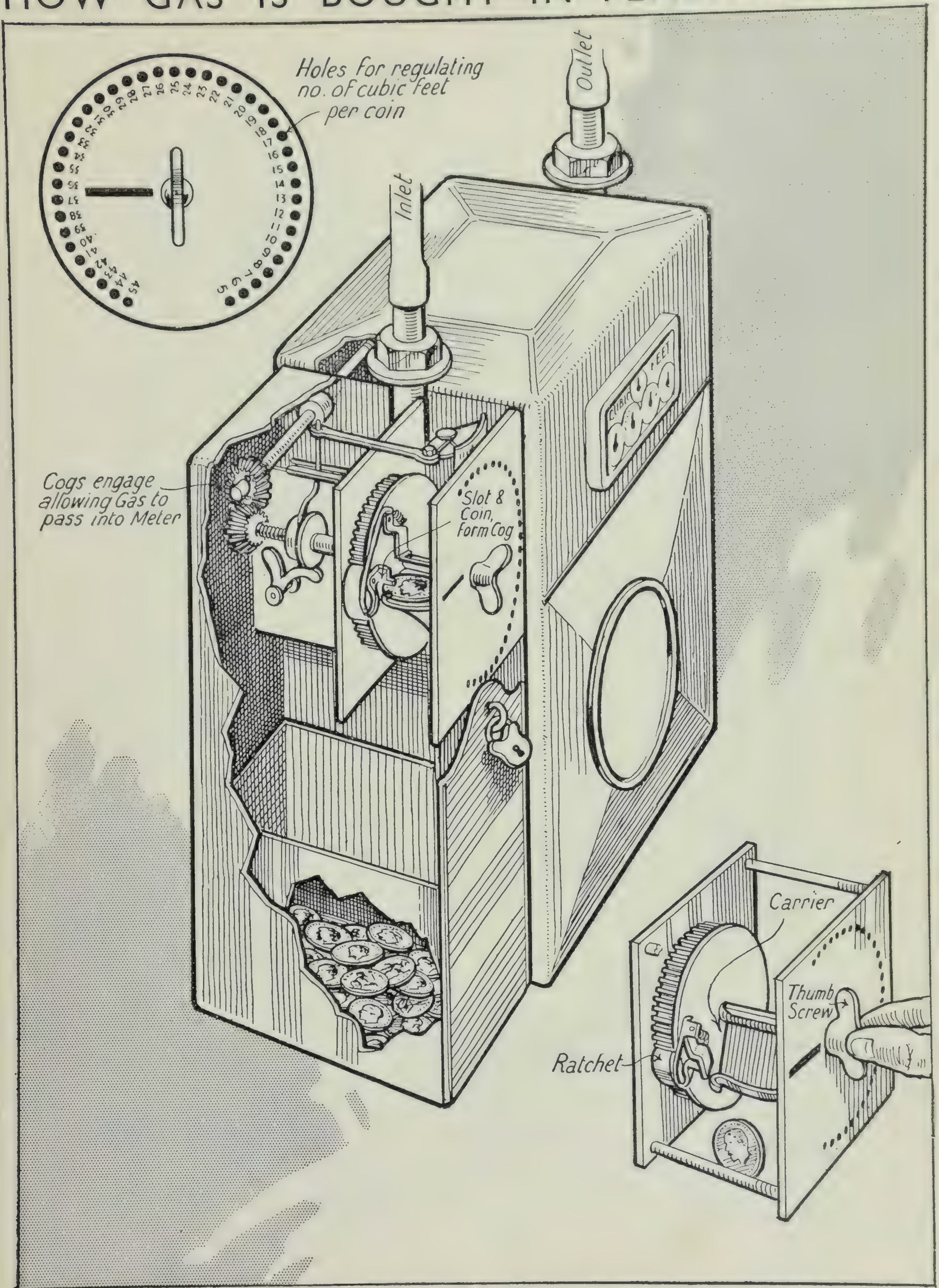
If an electric bell is set ringing continuously it will, after a time, exhaust the energy from the battery, but usually bells are only made to work for a short time at intervals. Then during the time they are not ringing the battery has time to recover from the loss of energy it has sustained, and is then able to provide current to make the hammer hit the bell when the next human finger touches the bell push.

HOW IS FOOD KEPT ICY COLD WITHOUT ICE?

MANY kinds of food decay and go bad quickly when exposed to the air, and to keep foodstuffs in the finest possible condition until they are required for use appliances known as ice-boxes and refrigerators are used. During warm weather and in hot climates these appliances are very necessary to arrest the natural development of decay.

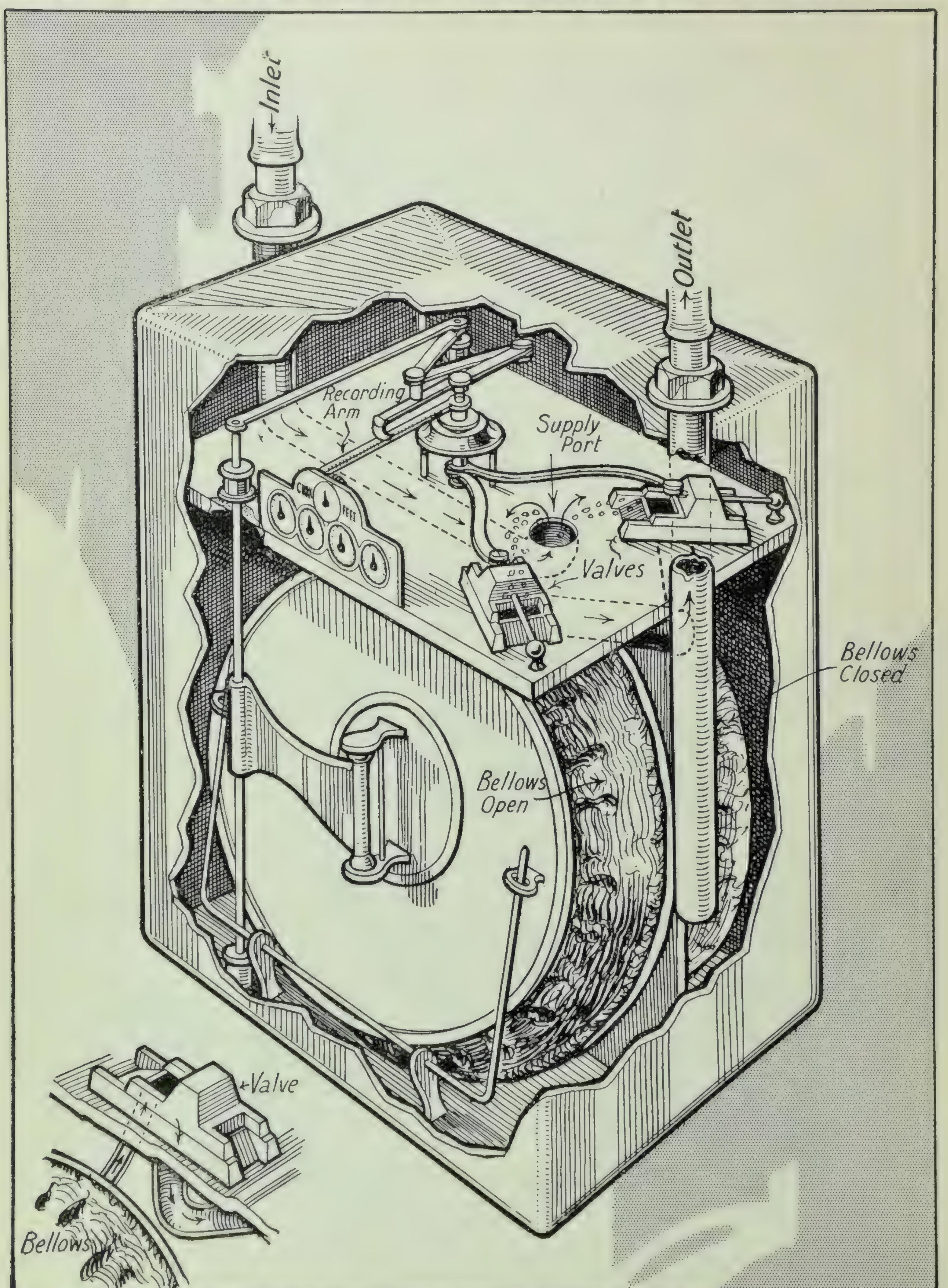
Two different kinds of cooling cupboards or home refrigerators are in use. Small ice chests or boxes, which are fitted with a section into which blocks of ice can be placed, can maintain a temperature of ten degrees above freezing point until the ice melts, when fresh blocks are required. These ice boxes are used a great deal in America during the summer months.

HOW GAS IS BOUGHT IN PENNYWORTHS


Holes for regulating no. of cubic feet per coin
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
Outlet
Inlet
Cubic Feet
Cogs engage allowing Gas to pass into Meter
Slot & Coin, Form Cog
Carrier
Thumb Screw
Ratchet

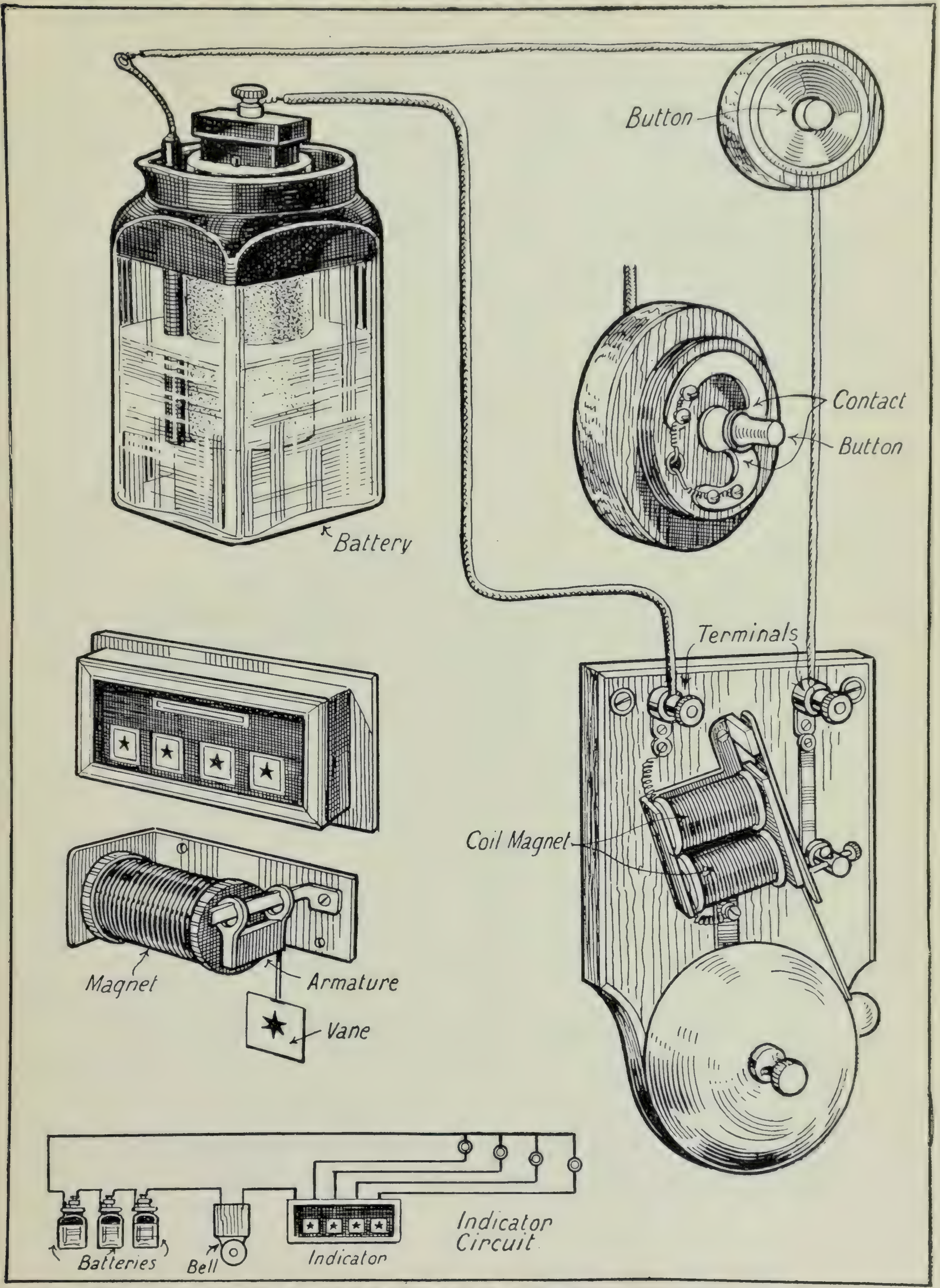
Some people find it much easier to buy their gas as they go along. So penny-in-the-slot meters are provided. The penny—or, sometimes, a shilling—is put in a slot and immediately operates a ratchet on a cog wheel, and cogs are engaged releasing gas to pass through the meter. When the regulated supply is used up another coin is needed.

THE RED BOX THAT MEASURES ALL OUR GAS


Inlet
Outlet
Recording Arm
Supply Port
Valves
Bellows Closed
Bellows Open
Valve
Bellows

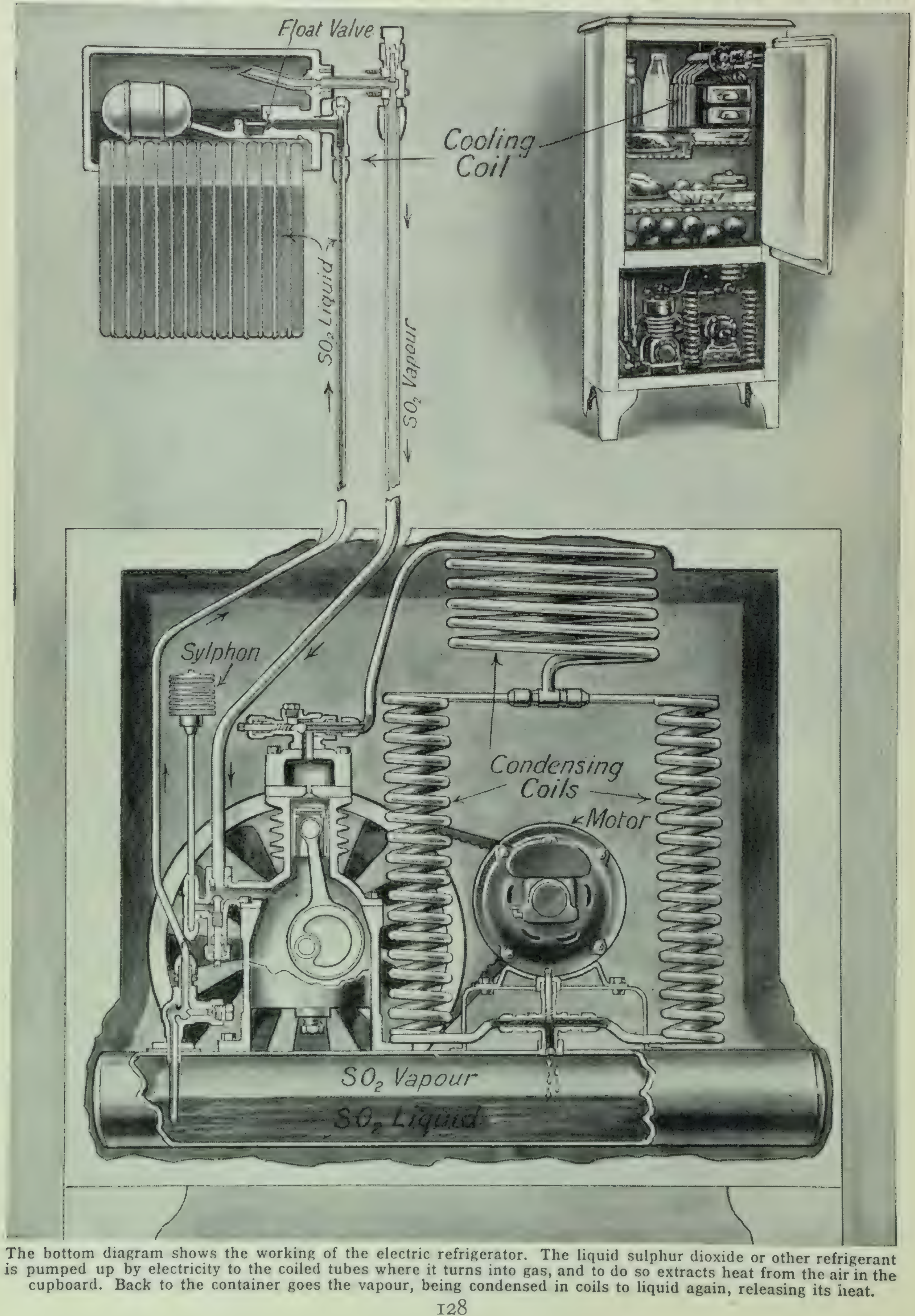
Here is a gas meter with the front and top cut away so that you may see the works. The gas enters by the inlet pipe and passes through one set of bellows. As the bellows are inflated the flag arm moves and works the mechanism controlling the measuring dials. The measured gas passes to the second bellows and the outlet pipe.

A SIMPLE ELECTRICAL OUTFIT TO MAKE


Button
Battery
Contact
Button
Terminals
Coil Magnet
Magnet
Armature
Vane
Batteries
Bell
Indicator
Indicator Circuit

The above diagram shows you how simple is the fitting up of an electric bell. The battery making the electricity is seen in the top left-hand corner. The electricity must go in a " circuit " to do its work. That is, it must run round and back again. When the bell-push button is pressed the circuit is completed and the bell rings.

HERE FOOD CAN BE KEPT COOL AND FRESH


Float Valve
Cooling Coil
SO_2 Liquid
SO_2 Vapour
Sylphon
Condensing Coils
Motor
SO_2 Vapour
SO_2 Liquid

The bottom diagram shows the working of the electric refrigerator. The liquid sulphur dioxide or other refrigerant is pumped up by electricity to the coiled tubes where it turns into gas, and to do so extracts heat from the air in the cupboard. Back to the container goes the vapour, being condensed in coils to liquid again, releasing its heat.

But the newest refrigerators are built like a small wardrobe. The upper section is provided with a heavy door which, when opened, discloses a white cubpoard with shelves on to which can be placed the foodstuffs which are not needed for several hours. This cupboard is icy cold, and it is kept thus without the use of blocks of ice and without attention.

In the lower section of the refrigerator is an all important compressor and an electric motor of one quarter horse power which is connected with the electric supply of the house. Attached to the motor is an automatic control which sets it in motion whenever the temperature in the white cupboard rises above a certain point. A belt connects the motor with the pump of the compressor and a cycle of operations begins.

Inside a number of coiled tubes is what is called a refrigerant. This means a quantity of ammonia, sulphur dioxide, ethyl chloride or carbon dioxide or a liquid substance which will readily turn into a gas, and draw heat towards it. The pump circulates this substance through the coiled tubes, which are arranged so that they are in contact with the air inside the white cupboard. Owing to the warm temperature inside the cupboard the ammonia inside the coils turns into vapour or gas and in doing so extracts heat from the air surrounding the coils. Having absorbed a little of the heat the gas travels on (always inside the tubes, which are sealed) back to the compressor pump where, after passing through a condenser coil pipe, it is converted back again into a liquid. The heat which it has captured is released, and the liquid refrigerant is then ready to go the round of the pipes again to collect more heat.

This strange cycle of liquid to gas and gas to liquid occurs again and again so long as the electric motor is running and the compressor pump is working. Slowly but steadily the warmth is extracted from the air inside the white cupboard until the desired temperature is reached, when the motor stops running automatically.

Such a refrigerating cabinet requires the door to be closed as much as possible, or the motor will be almost constantly running. Whenever the temperature rises above the setting the cycle of movements takes place.

A chemical material known as solid carbon dioxide is now manufactured in increasing quantities and is called " Dry Ice." This substance is delivered in small cardboard cartons and any food placed near to it is chilled or cooled until the block of " Dry Ice," which has no smell, gradually dwindles and melts away altogether.

HOW DOES AIR MAKE THE PIANO PLAY?

MANY students long to play the piano like some great performer, and everyone likes to hear the finest interpretations of beautiful musical works. After much thought and hard work mechanical pianos have been invented which will play themselves.

But a Player Piano, as this instrument is called, is much more complicated than an ordinary piano. Tucked away inside, between the front and the wires which give music to all pianos, is an intricate array of tubes, for the player piano depends upon air pressure to make each of the piano hammers strike the wires. In addition each piece to be played by the piano needs to be registered on a long roll of paper which is cut like a stencil with a number of holes. This work must be done with great accuracy, for there are eighty-eight holes which each represent a note on the piano, the length of the hole representing the length of the note.

The nerve centre of a player piano is a central brass bar, in the middle of which is a row of tiny square holes like those of a mouth organ, except that they are smaller. The roll of paper is fitted into position so that it passes tightly over these holes as it unwinds and is picked up again on another spool—like the film of a camera. As the roll passes slowly over the holes, compressed air is allowed to escape or be drawn in through the perforations which have been made in the paper. As each hole passes over the central or " tracker " bar, tiny pockets of air pass along the selected eighty-eight pipes connected to it. As the air rushes through these pipes it also fills up small chambers, the pressure being regulated by valves, and ultimately the air is conducted by further pipes to small bellows which are made to lift horizontal levers known as " pilots." These operate the piano hammers by making them strike the wires and thus give out the notes.

Long holes in the paper rolls keep the hammers pressed against the wires the necessary time to make long notes, and as soon as a hole passes over the tracker bar the hammer falls back into its position of rest.

The soft and loud or sustaining pedals on a piano player need further apparatus connected with each of the eighty-eight hammers. These pedals may be worked by the person operating the piano by moving a button or lever. The whole instrument is set going and kept in action by treading upon two pedals which not only keep the player roll of paper moving across the tracker bar, but also supply the air pressure or create the vacuum as needed.

Reproducing Pianos designed to reproduce perfectly the exact expression of well-known master pianists are still more complicated instruments, and in these all control is arranged automatically without interference by the operator. Specially cut rolls are used with perforations along the margins for the loudness or softness of particular notes, and other devices for the control of passages of the music which grows gradually louder or softer.

HOW A VACUUM CLEANER SUCKS UP DUST

IT is a bothersome business every day sweeping and brushing the fluff, dust and dirt that creeps into houses and homes, and when tiny pieces of paper and litter are scattered over the floors rooms become very untidy. Strictly speaking a vacuum is an empty space, and the word vacuum should not be used for a device which really uses only a partial vacuum or suction as its principal power.

Invented as long ago as 1901, a vacuum cleaner consists of an air suction chamber, usually fitted with a very rapidly revolving fan, and an air filter which cleanses the air after it has been drawn past the fan and allows the air to escape again, freed from the dust or dirt which it has drawn up. The filter is made of very stout cloth in the shape of a bag which, when the cleaner is working, is blown out like a balloon.

Various types of nozzles are supplied with the main suction chamber, which is sometimes mounted on little wheels and made as light as possible so that it may be moved about easily. In the electrically worked models a long length of cable is connected with the nearest power supply, and upon the fan being set in motion by moving a simple switch on a long guiding handle, air rushes violently inwards through the nozzle. By placing the proper type of nozzle close to a carpet, floor, chair, or other object the loose dust and dirt is carried away in a stream past the whirring fan and thrown into the bag, where its further progress is stopped by the filtering action of the cloth of the bag. The air escapes from the bag in all directions, and at intervals the collected dust and dirt can be shaken out of the filtering bag into a large dust bin or other receptacle.

Small hand vacuum cleaners which contain a high speed fan geared to a fly wheel weighing several pounds are used. These machines create their own suction in the same way as the electrically driven models, except that it is necessary to run them backwards and forwards to work the fan. The suction generated by this type of cleaner is not so great as is obtained with electric cleaners.

Of the electrically driven models there are three different types. First, the high vacuum cleaner which depends entirely upon the strength of the suction for its cleaning properties, secondly, a cleaner which uses suction and is also fitted with a revolving wheel-driven brush to pick up litter on smooth surfaces, and thirdly an apparatus which not only uses suction created by a metal fan, but also has a motor-driven brush and a metal drum which beats the surface and causes vibration to assist in drawing up dirt which is embedded or below the surface of the material to be cleaned.

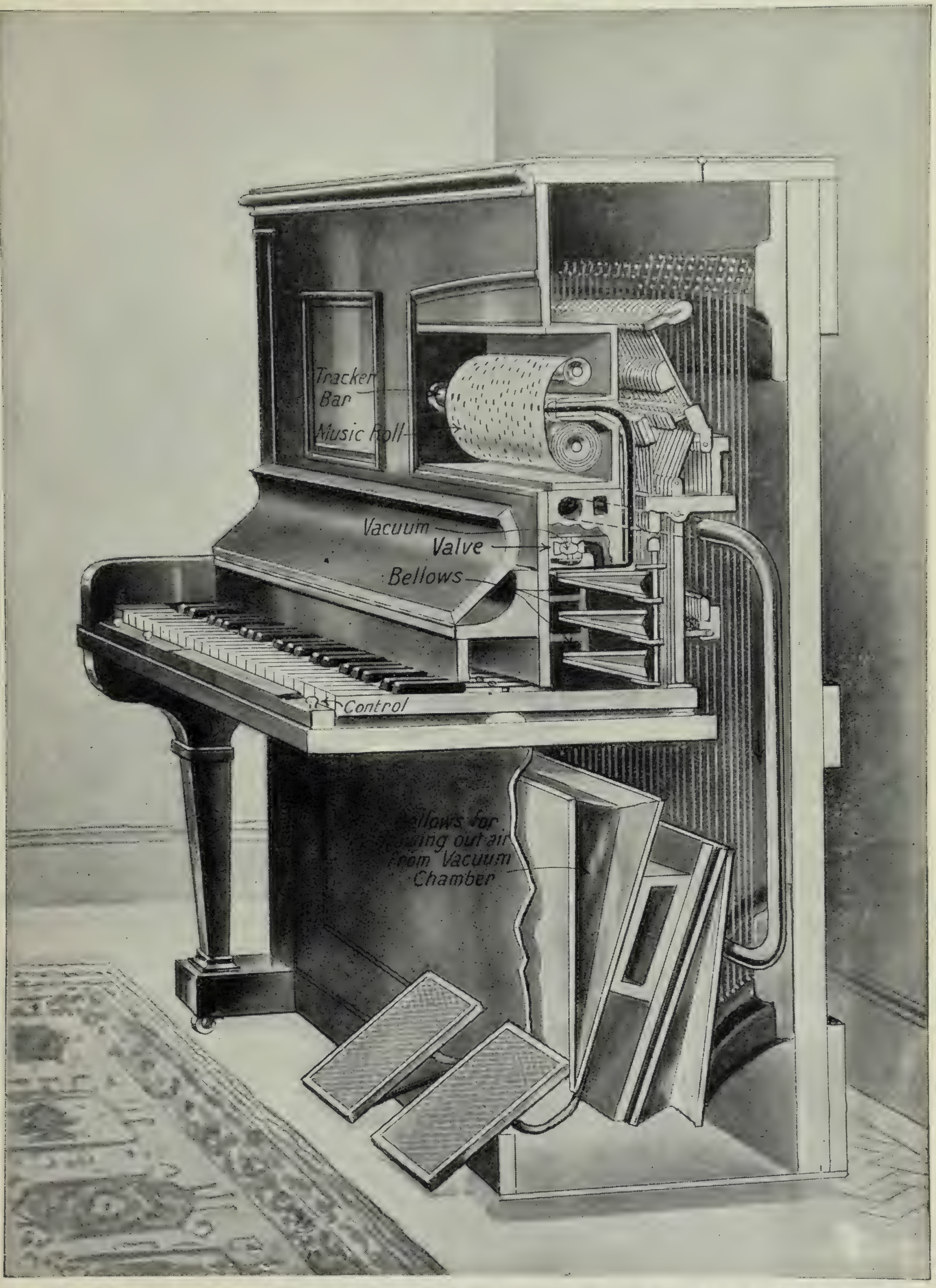
Amongst the clever devices which are supplied with home vacuum cleaners nowadays are long sections of tubing which allow the suction nozzle to reach up to clean the ceiling and picture rails without step ladders, small brushes which sweep the dirt within range of the nozzle and slot-shaped nozzles that penetrate deep into the crevices of furniture.

Suction cleaning is also arranged by contract. Large motor-driven cleaning machines mounted on motor trucks stop outside a house and long lengths of tubing are led in through the windows. Every corner is cleaned with a minimum of disturbance with the help of just simply—a partial vacuum.

HOW DOES HOT WATER GET INTO THE TAP?

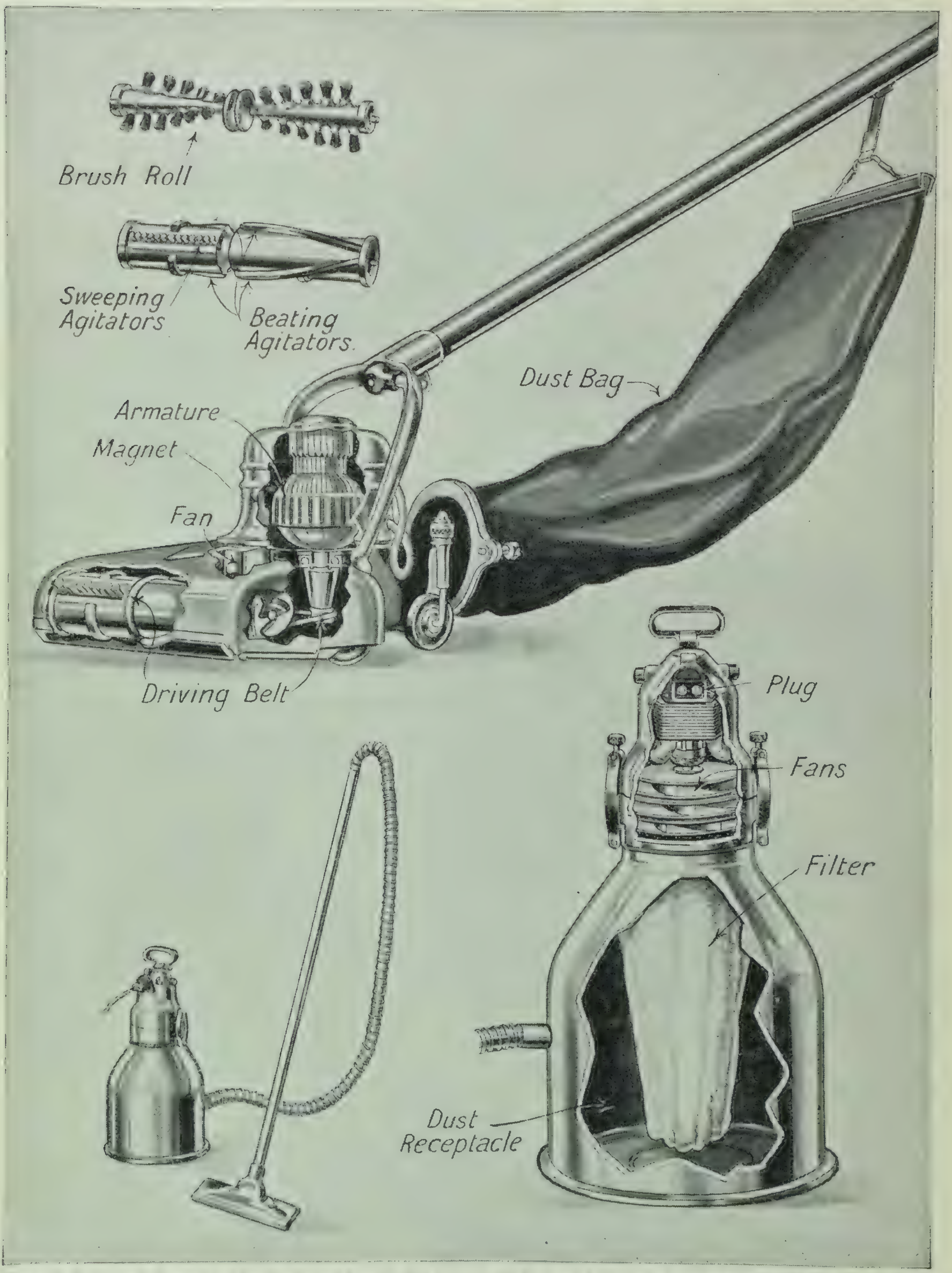
AFTER a rugger match or a game of soccer it is a fine thing to plunge into a warm bath. Turn on the hot water tap and a stream of warmed water keeps running from it for quite a long time. The source of the heat is usually a small boiler at the back of the kitchen grate, or a small stove on one of the ground floor or basement rooms. But how does such a small source heat enough for a bathful of hot water?

THE PLAYER PIANO—A PEDAL MUSICAL BOX


Tracker Bar
Music Roll
Vacuum
Valve
Bellows
Control
Bellows for drawing out air from Vacuum Chamber

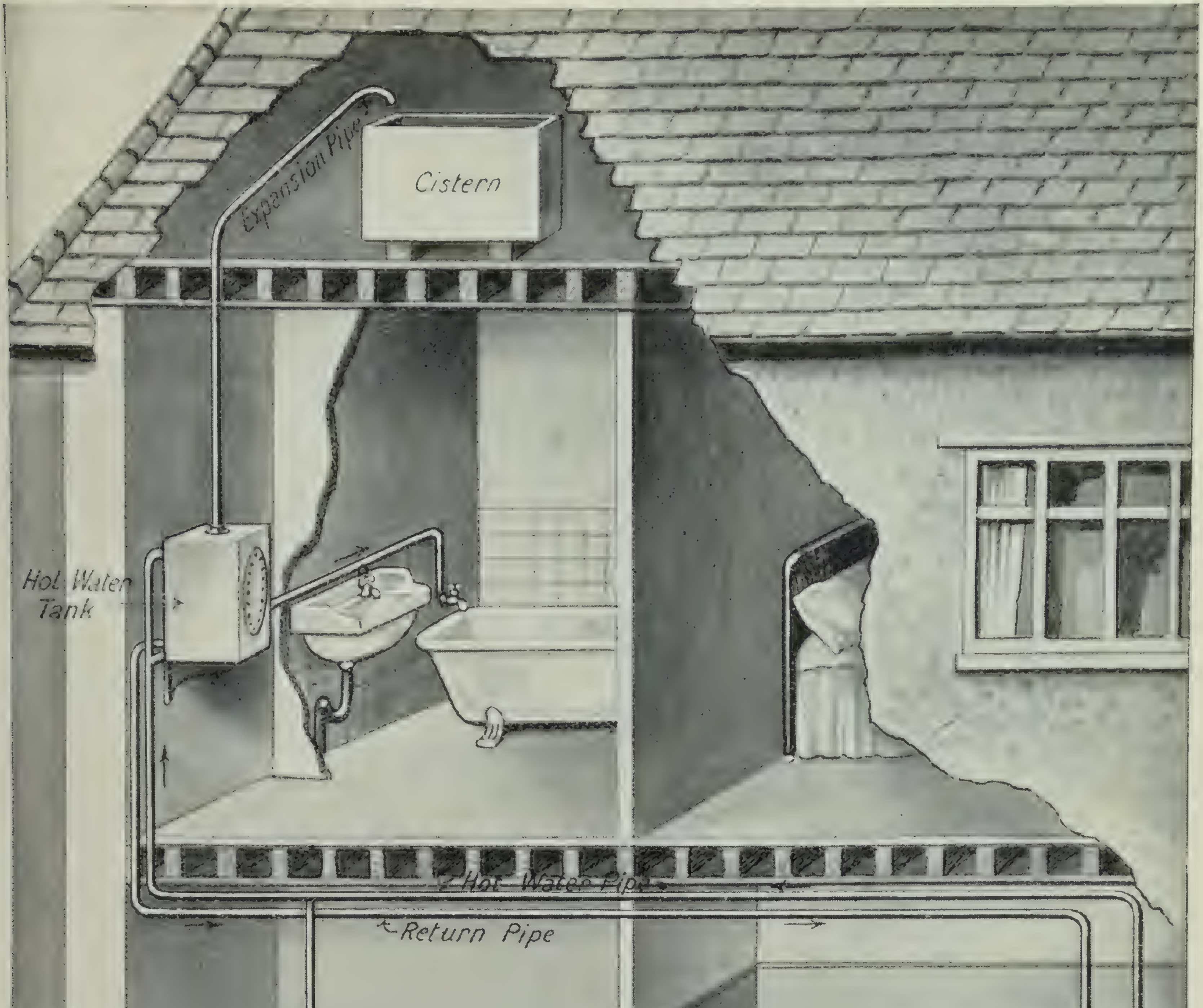
Even if you are no pianist you can operate a player piano. Air is pumped into the bellows by working the pedals. As the music roll passes over the central bar air is released through the holes in the part of the roll travelling by at the moment. Thus the hammers are forced against the strings, notes are played, and tunes begin to trickle forth.

THE MONSTERS WHOSE MEAT IS DIRT AND DUST


Brush Roll
Sweeping Agitators
Beating Agitators
Dust Bag
Armature
Magnet
Fan
Driving Belt
Plug
Fans
Filter
Dust Receptacle

The old-fashioned duster and feather mop disturb the household dust, which settles again later. The modern vacuum cleaners, two types of which are shown above, provide a strong current of air which picks up all dust and deposits it in a special bag or container. It cannot then escape again into the room, but may be taken out and thrown away.

OUR WELCOME HOT WATER AND ITS SECRET


Expansion Pipe
Cistern
Hot Water Tank
Hot Water Pipe
Return Pipe
Boiler behind Stove

Here a house has been shown as if cut in two. The hot-water pipes only have been drawn, so that you will not be confused. The cold water enters the cistern in the bathroom and runs down the "return" pipe to the boiler behind the fireplace downstairs. Here the fire warms it and, as hot water, it returns to the cistern upstairs. When hot water is drawn from a tap, cold water runs into the bathroom cistern from the mains, and thus the process goes on. The overflow either goes back into the cistern in the attic or out at a pipe through the house wall.

The Romans were most particular about their water supply, and this conduit, discovered when digging in Kent, shows how they brought the water to the baths.

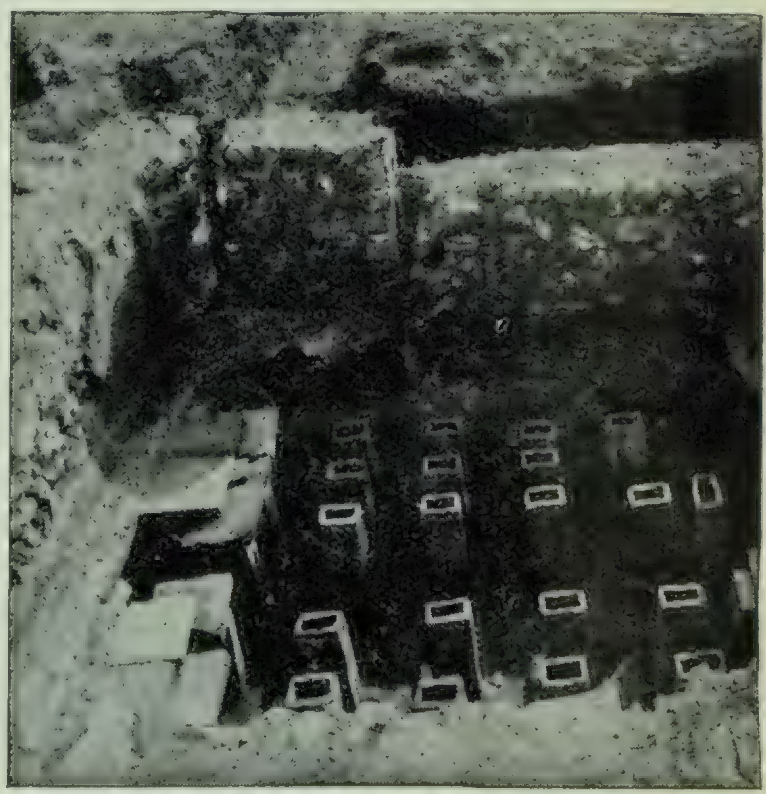
The hot water system of a modern house depends upon the fact that water when heated rises, and although rather less than one half of the heat in a coal or coke fire is passed on to the water in the boiler it is sufficient to cause it to seek a higher place. By inlet and outlet pipes the heated water is allowed to circulate into a cylinder or tank which is placed higher than the boiler, usually in a convenient cupboard where linen and towels may be kept perfectly dry by the heat radiated from the metal of the tank or cylinder. Still higher up, usually just below the tiles or slates, is the refilling cistern which is supplied by a pipe from the water main.

At the point where this pipe empties into the cistern a clever valve is fixed. This valve is opened or closed by a long metal arm, fixed at the end of which is a sealed ball containing air. The ball floats on the surface of the water in the cistern.

As a hot water tap is turned on the heated water from the collecting tank runs along the connecting pipe, drawing more water from the small boiler and again cold water from the cistern to keep the pipes completely filled. The surface of the cistern drops as the water is drawn from it, and the sealed air ball drops, allowing fresh water from the main supply to fill up the cistern. The main supply keeps on running just as long as the ball is not floating at the proper level.

Another type of water heater is known as a geyser, which is fitted in a bathroom. This device heats the water as it passes through a very finely coiled pipe. Gas flame burners are used, and care must be taken to make sure that the water is running the whole of the time the flames are alight. Cold water is released by a tap into a small funnel at the top of a geyser and after it has whirled around through the coil it issues from a brass tap in an almost boiling condition. One of the advantages of this method of heating water is that cold water can instantly be converted into hot; just as much hot water is provided as needed, but the speed of the supply is such that several minutes are needed to fill a bath. Small gas coil heaters which may be attached to hand basins are also used, working upon the same principle as the larger kinds.

But in large buildings such as hotels, blocks or flats and groups of houses, central water-heating systems are arranged. A single furnace and boiler are made to supply not only hot water taps, but also radiators in corridors and rooms, and by an arrangement of ducts, warmed air is also sometimes supplied through gratings in the walls. The idea of supplying hot water for baths through pipes dates back to the times of the Romans.



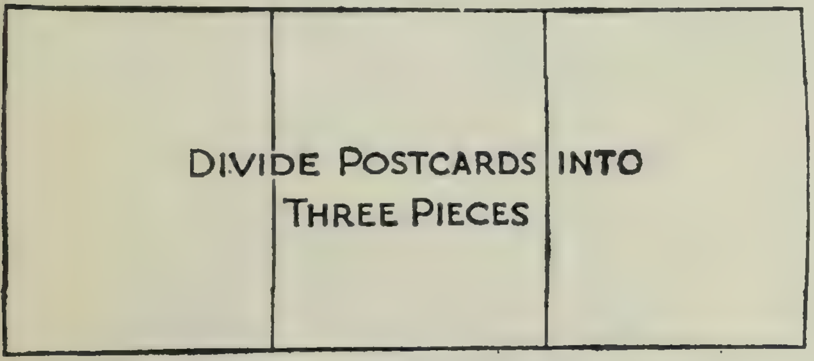
These pipes are the remains of a Roman domestic heating system, found when digging down on the site of an ancient Roman house in England. Hot air was driven through these pipes from a furnace under the floor. Thus were Roman houses kept at an even temperature.

THE GAME OF GEOGRAPHICAL DOMINOES

It is amazing how many games can be constructed by boys and girls from the simplest of materials. For the game of Geographical Dominoes all that is needed is a pack of plain postcards. Then, with a pen and an atlas, the cards may be produced.

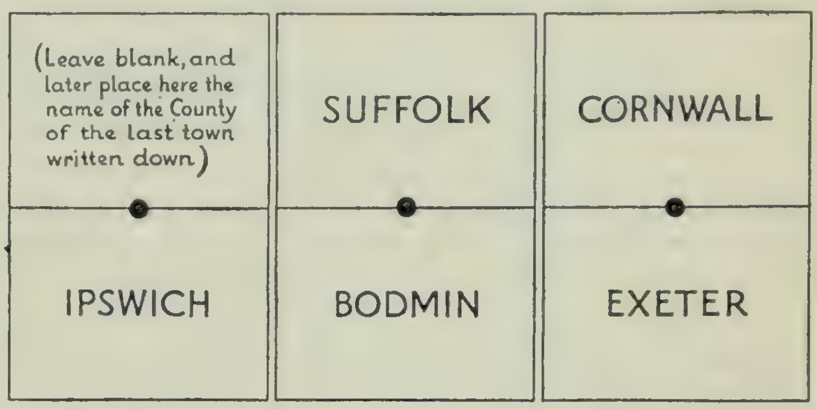
Hobbies and games are welcome to all healthy children, and here, as a break in our reading, we turn to something to make and do. To make your own game is half the fun—and gives as much enjoyment as the actual playing of it. To have a hobby that will last to the end of your life and grow in interest as you grow in years is certainly worth while Stamp collecting is such a hobby The other games described give you an opportunity of using both hand and brain.

First clip each postcard into three equal pieces. When all have been so divided, rule a line across the middle of each piece, dividing into two parts. You have now prepared, as it were, a large number of double blank dominoes. Now take the first one and, leaving the top half blank, print neatly on the bottom half the word Alnwick. Take the next card and, on the top half, print Northumberland. You have now printed on one card the name of a county and on another card its county town. This is the idea throughout the series. The top half of each card will contain the name of a county in England while the lower half will contain the name of a county town. If you are just taking the counties of England you will need 40 cards. England and Wales together will give a pack of 52 cards. In any case, when you get to the end of your pack you will find that on the lower half of the last card you have written the name of a county town and you will require a space for its county. The space for the name of this county is on the upper half of the first card you wrote, which you remember was left blank.

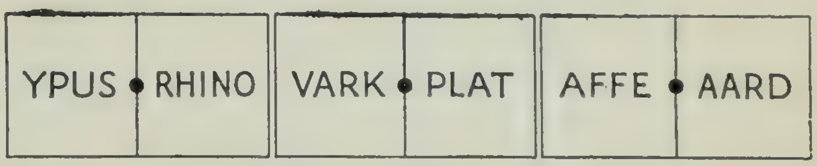


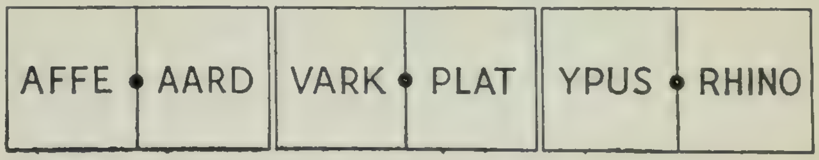
The game may be played in many ways, and you will find out some of these as you become more familiar with the pack. The easiest way is to shuffle the cards and share them out among two, three, or four players. A player lays down a card on the table, and the next player fits, if he can, another card to it, either placing a county town next to its appropriate county, or vice versa. So the game goes on. The game depends on the players' knowledge of geography, and so it might be necessary for each player to have a political map of our country in front of him. You will see at once that the player who has learned his counties and county towns will have a great advantage, for unlike the game of dominoes proper, there is only one card which can fit at each end of the line of cards lying on the table as the game proceeds.

One of the rules of the game should be, that if there is any hesitation on the part of the player whose turn it is to put down the card, any other player having a card to fit should be allowed to put it down. The one who is rid of his cards most quickly wins the game. This matching of counties and county towns will teach you a great deal, and when you feel you know all these off by heart it will be interesting to make other sets of cards such as (1) Countries and their Capitals; (2) Countries and their Chief Ports, etc.


(Leave blank, and later place here the name of the County of the last town written down)
IPSWICH
SUFFOLK
BODMIN
CORNWALL
EXETER

In geography, as in all subjects, one tries to understand there are certain things that must really be learned by heart. You will find the domino game a very enjoyable and exciting way of memorising these necessary facts.



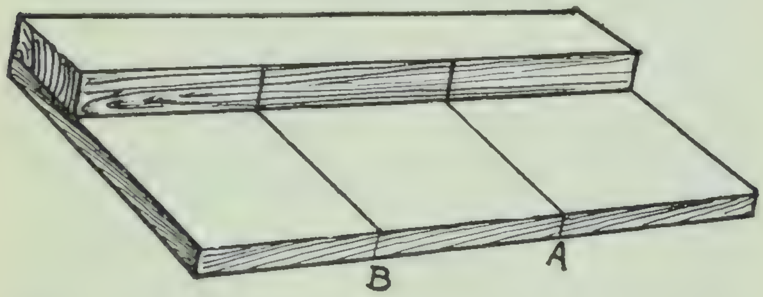


The domino idea may also be extended to natural history, half an animal's name being on one card, and the rest on another. The cards seen in the first diagram above seem queer, but when rearranged, as in the second sketch, two animal names appear.

HOW YOU MAY MAKE A PHOTOGRAPH LIVE

IT may be that many of you have, somewhere at home, a stereoscope. A few years ago these instruments were very popular. A card bearing two similar pictures side by side was held in position in front of the lenses, and when one peeped through it was found that the two pictures had become one, and that everything in the picture was standing out in relief just as in the actual scene.

The reason for this "becoming alive," as it were, of the picture, was due to the fact that the two photographs on the card were not quite alike even though they seemed to be. The photograph had been taken with a camera which had two lenses, the distance between these two lenses being the distance between the two eyes of a normal human being. Then the lenses of the stereoscope, acting as our eyes do when each of them see the same object at the same time, throw the two photographs into one, which stands out in relief as though natural.



DO YOUR TWO EYES EACH SEE EXACTLY THE SAME PICTURE?

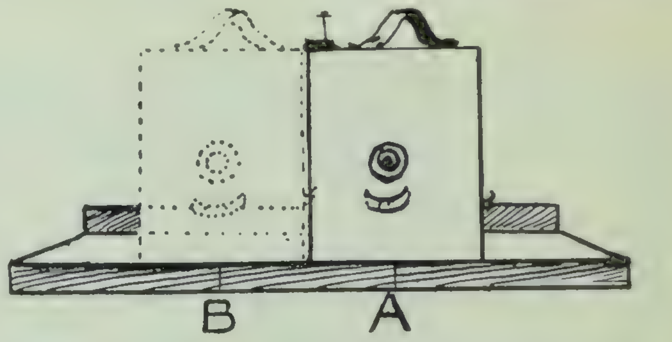
Our left eye does not see an object in the same manner as does our right eye. If you want to test this, place on a table, say, a candlestick, then set up about a foot behind it a wider object such as a book standing on end. Then about a foot behind that place a wider object.

Now stand in front of the candlestick so that the three objects seem in a line one behind the other. Cover up the right eye and note what parts of the book and the rear object seem to show behind the candlestick. Cover up the left eye and note how different parts of these objects show behind the candlestick.

You will then realise that our eyes are placed a little distance apart so that we are able to see a little behind near objects, and thus gauge how far behind them other objects are. The person with one eye has the disadvantage of not being able to gauge depth or distance between one object and another behind it. A stereoscopic picture, then, is so arranged as to show that depth, and if you look at one of the pictures through the left eye and the other through the right, in turn, you will find that different parts of objects farther away are seen behind the nearer objects in the respective pictures.

HOW TO MAKE A FLAT PICTURE SPRING TO LIFE AND RELIEF.

Now you can take stereoscope pictures with an ordinary camera in the following way. Place your camera facing the object you wish to take, and let it rest on a piece of board with another piece of wood nailed along the edge as in the first sketch. On the first board are drawn two lines from back to front. These two lines are exactly the same distance apart as from the centre of your left eye to the centre of your right eye. You can easily measure this distance by putting a ruler before your face when standing in front of a mirror. Now fix your camera so that it lies straight along the line *A* and take your photograph. Turn on your film, move your camera to the line *B* and take another photograph of the same scene with the same exposure. When the photographs are developed and printed, paste one of each on to a card, taking great care to place the photograph which was taken from the left on the *right* side of the card, and the one which was taken from the right on the *left* side of the card. This transposing of the photographs is important. Look through the stereoscope at the pictures as you put them into position. As they blend entirely into one picture you will be amazed to find that your picture springs to life, and that every object in it is modelled in relief.



Good cameras for taking stereoscope photographs are very expensive, but by the method above described you may make your pictures live even though you take them with the cheapest kind of box camera. If you have a stereoscope at home, therefore, it is worth while taking a few good views in couples, as described, and making living pictures. Choose subjects showing plenty of depth, that is, with objects very near and other objects going farther back.

THE JOYFUL HOBBY OF STAMP COLLECTING

THE hobby of postage stamp collecting, or *philately*, as it is called, is a most interesting, profitable, and educational pastime.

Most hobbies boys and girls adopt are such that they grow out of them as they grow older. Stamp collecting, however, takes a firmer hold on the collector as the years pass, and some of our most noted philatelists are elderly men.

CAN A MERE POSTAGE STAMP BE WORTH A FORTUNE?

One of the most noted collectors of postage stamps of all nations and ages is His Majesty King George V. whose magnificent collection is worth thousands of pounds. Some of his stamps are worth hundreds of pounds each. Why? Because they are very rare. Such stamps as the "Blue Mauritius" are worth many, many times their weight in gold, as only a few of this kind were ever issued, and fewer still exist to-day. So you see, you may, in your collecting of foreign stamps, pick up a veritable gold mine some day.

Sometimes a certain set of stamps of some country has a blemish, or a wrong shade of colour, and when the next set is printed the error is corrected. The wrongly printed stamps have then a value that increases with age, for many of the incorrect set are lost or destroyed, and the careful collector who has a copy in his or her album finds that stamp a profitable investment.

Again, your interest in the world will be quickened and your knowledge broadened as a result of your hobby. Where is Jaipur state, where Liberia, where Perak, and what are the Leeward Islands? You will soon know if you begin this fascinating hobby. You will wish to read about the countries of which you get the stamps. Then you will admire the designs, and be curious about the coinage, the picture or map on the stamp, the language and many other fascinating aspects of your hobby. You will begin to love geography, history, biography and natural history.

You may collect stamps of certain types, such as zoological stamps, bearing pictures of animals, birds, etc., or portrait, view or map stamps. Four pages of stamps, showing some of the animal, view, portrait and map stamps you may easily acquire are given, so that you may gain some idea of the beauty and interest in "specialised" collecting.

You can collect galleries of kings, queens, princes and presidents; you may seek portraits of famous saints, scientists, discoverers, etc., or scenes of historical interest. In the stamps of the U.S.A. alone you may build up a gallery of presidents of that great American republic, and as you do so you will long to find out all about them.

You will also come across various sizes and shapes, from the tiny, narrow stamp issued by the state of Victoria, Australia, in Queen Victoria's reign, to the triangular stamps once issued by the Cape of Good Hope, and large stamps such as that of Paraquay, shown in our pages of pictures.

WILD BEASTS STARE AT YOU FROM THE STAMP ALBUM.

Dragons from China, tigers from Perak, camels from Sudan, gorillas from North Borneo, and elephants from Liberia. Do they not sound exciting? They are—and so are all the stamps.

If you begin with your own land and obtain a "penny black" you will have one of the first stamps issued, in 1840, when Rowland Hill succeeded in introducing the Penny Post into England, and thus enabled the working folks to write more often to their friends and relations.

Sometimes you will find a stamp which has its original value printed out with black ink and another value over-printed. These stamps are sometimes valuable. There is, for instance, a South African stamp printed by the Boers just before the South African War that ended as the present century dawned. When the

NATURAL HISTORY STAMPS ; KEY TO P. 138

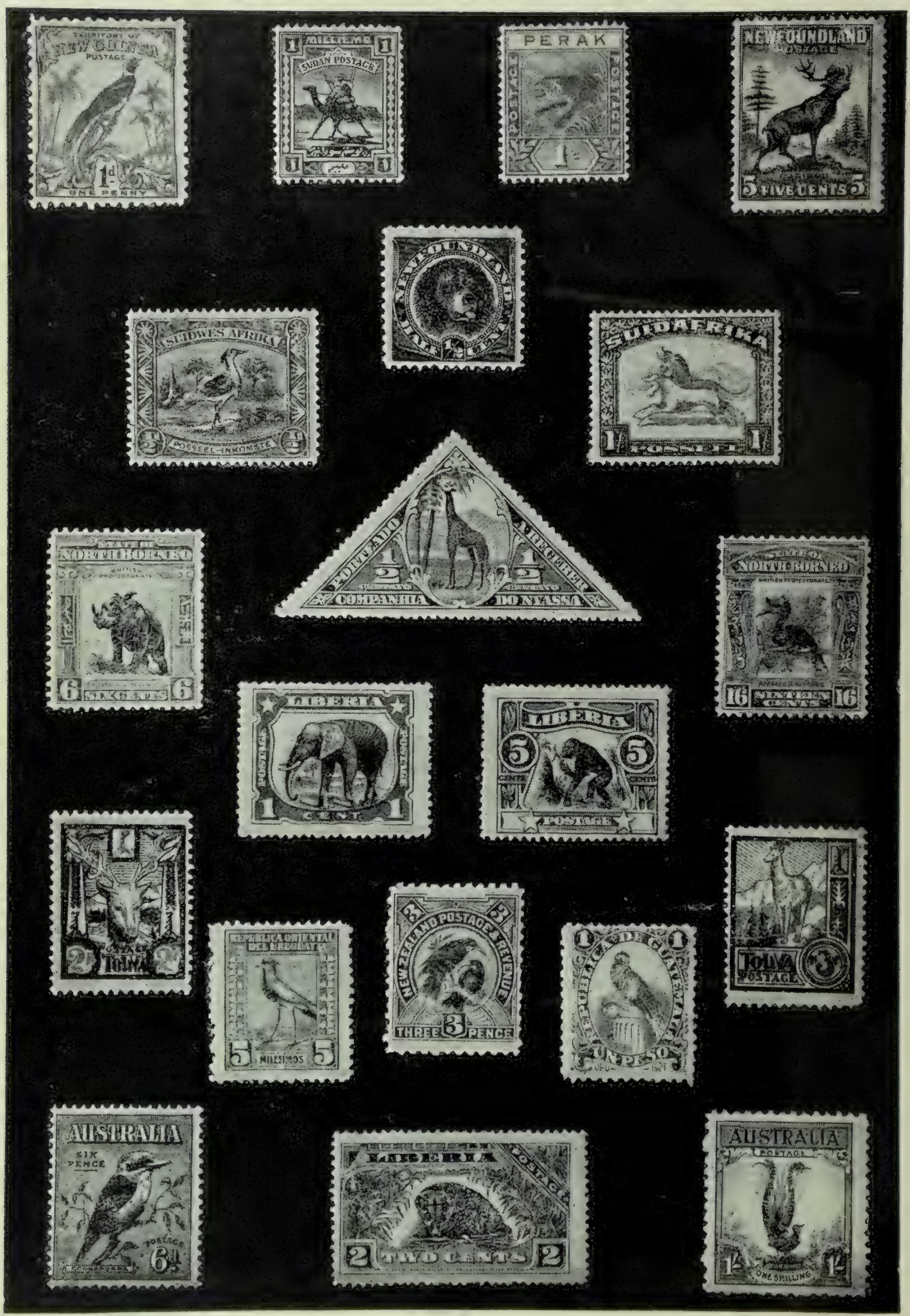
Reading from left to right, commencing at top line

Country of Origin.	*Description.*
New Guinea	Bird of Paradise
Sudan	Camel
Perak	Tiger
Newfoundland	Caribou
South-West Africa	Gom-pauw
Newfoundland	Newfoundland Dog
South Africa	Gnus
North Borneo	Rhinoceros
Nyassa	Giraffe
North Borneo	Hornbill
Liberia	Elephant
Liberia	Chimpanzee
North Mongolia	Stag
Uruguay	Teru-teru
New Zealand	Sacred Huia Birds
Guatemala	Quetzal
North Mongolia	Mountain Goat
Australia	Kookaburra
Liberia	Palm Civet
Australia	Lyrebird

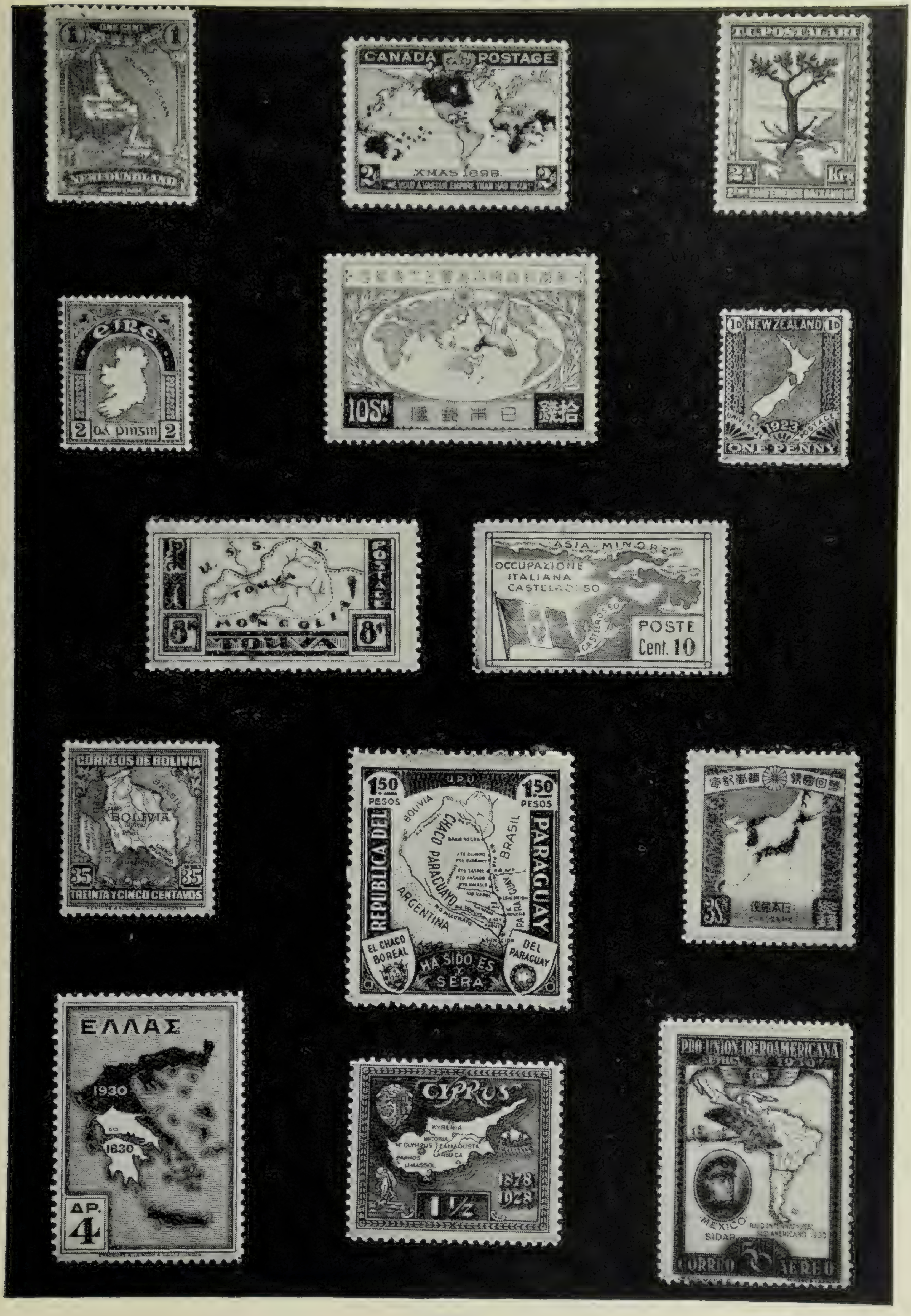
MAP STAMPS ; KEY TO PAGE 139

Newfoundland	Newfoundland
Canada	British Empire
Turkey	The Balkans
Irish Free State	Ireland
Japan	The World
New Zealand	New Zealand
North Mongolia	N. Mongolia (Tan na Touva
Castelrosso	Island of Castelrosso
Bolivia	Bolivia
Paraguay	Paraguay
Japan	Japan
Greece	Greece (1830 and 1930)
Cyprus	Cyprus
Spain	South America

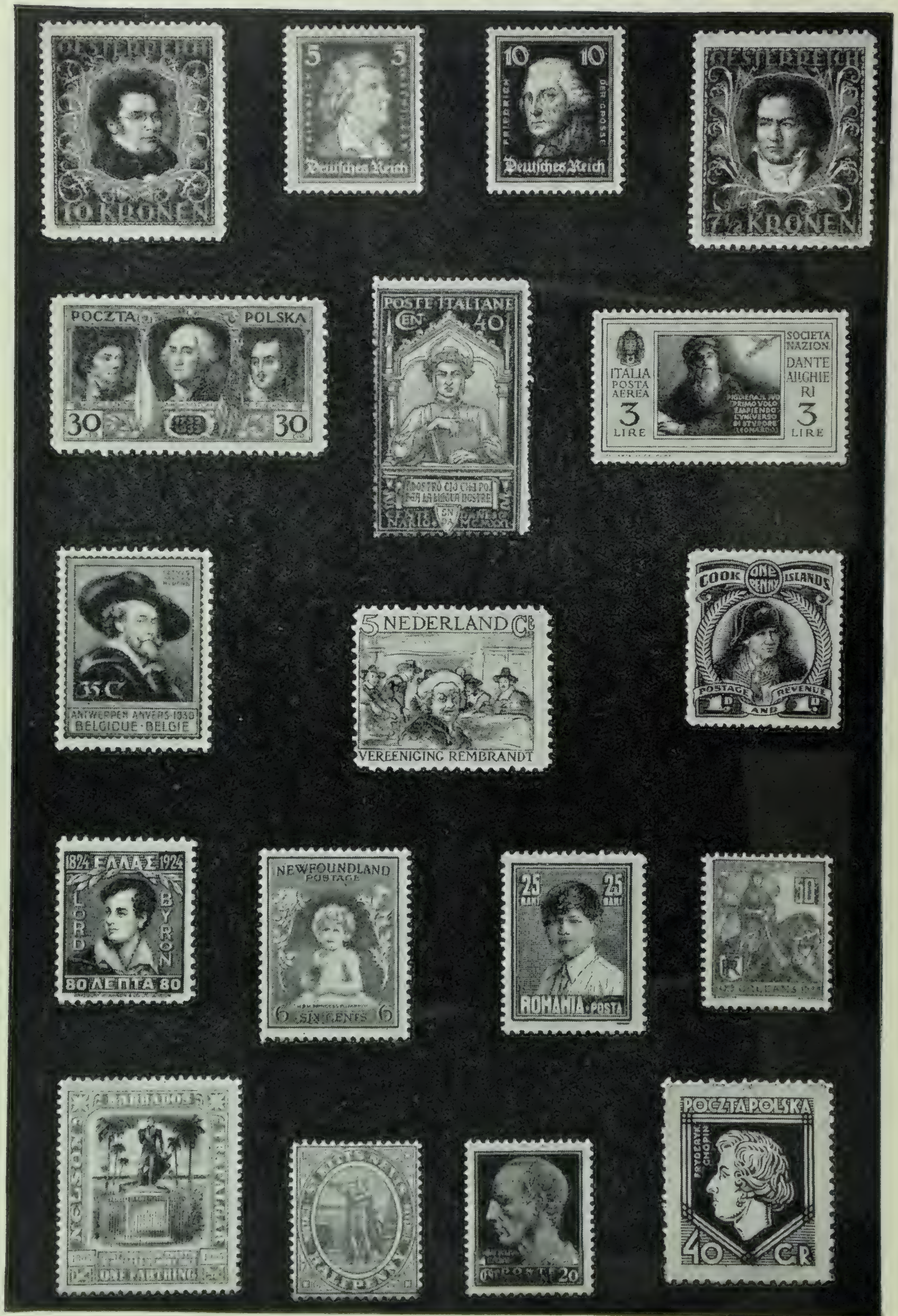
NATURAL HISTORY ON THE WORLD'S STAMPS


NEW GUINEA
POSTAGE
1d
ONE PENNY
1 MILLIEME 1
SUDAN POSTAGE
PERAK
1c
NEWFOUNDLAND
POSTAGE
5 FIVE CENTS 5
NEWFOUNDLAND
SUIDWES AFRIKA
POSSEEL-INKOMSTE
SUIDAFRIKA
1/ POSSEEL 1/
PORTEADO RECEBER
1/2 1/2
COMPANHIA DO NYASSA
STATE OF NORTH BORNEO
BRITISH PROTECTORATE
6 SIX CENTS 6
STATE OF NORTH BORNEO
BRITISH PROTECTORATE
16 SIXTEEN CENTS 16
LIBERIA
1 CENT 1
LIBERIA
5 CENTS 5
POSTAGE
TOLIMA
TOLIMA POSTAGE
5 MILESIMOS 5
NEW ZEALAND POSTAGE & REVENUE
THREE 3 PENCE
REPUBLICA DE GUATEMALA
UN PESO
AUSTRALIA
SIX PENCE
POSTAGE
6d
LIBERIA
POSTAGE
2 TWO CENTS 2
AUSTRALIA
POSTAGE
1/ ONE SHILLING 1/

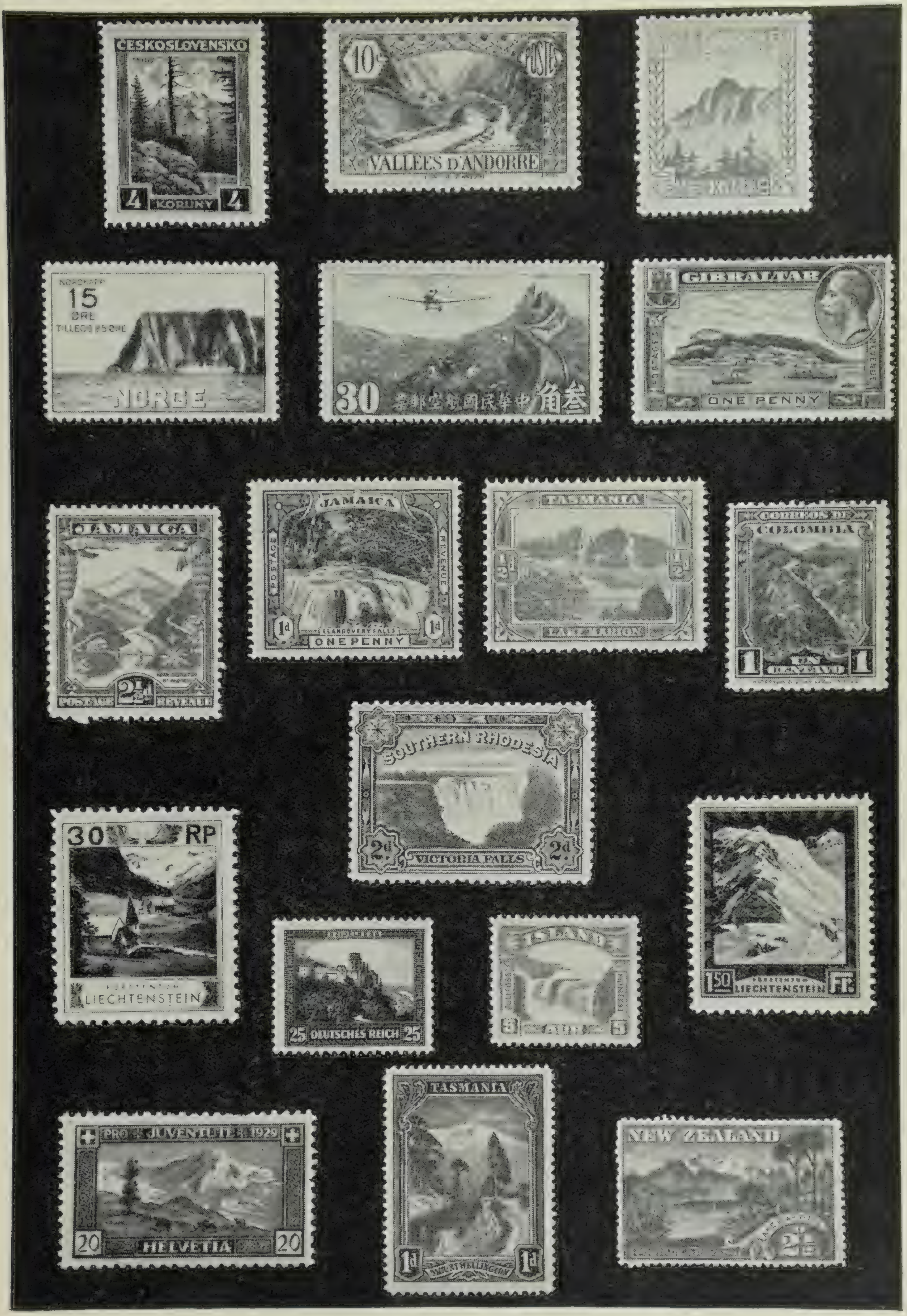
HERE HISTORY AND GEOGRAPHY BLEND


NEWFOUNDLAND
CANADA POSTAGE
XMAS 1898
WE HOLD A VASTER EMPIRE THAN HAS BEEN
éire
2 pinsin 2
10 Sn
1D NEW ZEALAND 1D
1923
ONE PENNY
U. S. S. R.
TOUVA
MONGOLIA
POSTAGE
ASIA MINORE
OCCUPAZIONE ITALIANA CASTELROSSO
POSTE Cent. 10
CORREOS DE BOLIVIA
BOLIVIA
BRASIL
TREINTA Y CINCO CENTAVOS
1.50 PESOS
REPUBLICA DEL PARAGUAY
BOLIVIA
CHACO PARAGUAYO
BRASIL
ARGENTINA
EL CHACO BOREAL
DEL PARAGUAY
HA SIDO ES Y SERA
ΕΛΛΑΣ
1930
1830
ΔΡ. 4
CYPRUS
KYRENIA
NICOSIA
LARNACA
LIMASSOL
PAPHOS
1878 1928
1½
PRO UNION IBEROAMERICANA
MEXICO
SIDAR
CORREO AEREO

A PICTURE GALLERY OF POSTAGE STAMPS


OESTERREICH
10 KRONEN
5 5
Deutsches Reich
10 10
FRIEDRICH DER GROSSE
Deutsches Reich
OESTERREICH
7½ KRONEN
POCZTA POLSKA
30 30
POSTE ITALIANE
CENT 40
ITALIA POSTA AEREA
3 LIRE
SOCIETA NAZION. DANTE ALIGHIERI
3 LIRE
35 C
ANTWERPEN ANVERS 1930
BELGIQUE · BELGIE
5 NEDERLAND CT
VEREENIGING REMBRANDT
COOK ONE PENNY ISLANDS
POSTAGE AND REVENUE
1824 ΕΛΛΑΣ 1924
LORD BYRON
80 ΛΕΠΤΑ 80
NEWFOUNDLAND POSTAGE
6 SIX CENTS 6
25 BANI 25 BANI
ROMANIA · POSTA
BARBADOS
NELSON
ONE FARTHING
HALFPENNY
POSTE 20
POCZTA POLSKA
FRYDERYK CHOPIN
40 GR

BEAUTIES OF NATURE ON POSTAGE STAMPS


ČESKOSLOVENSKO
4 KORUNY 4
10c POSTES
VALLÉES D'ANDORRE
15 ØRE
NORGE
30 中華民國航空郵票 叁角
GIBRALTAR
ONE PENNY
JAMAICA
POSTAGE 2½d REVENUE
JAMAICA
POSTAGE REVENUE
LLANDOVERY FALLS
1d ONE PENNY 1d
TASMANIA
½d ½d
LAKE MARION
CORREOS DE COLOMBIA
1 UN CENTAVO 1
SOUTHERN RHODESIA
2d VICTORIA FALLS 2d
30 RP
LIECHTENSTEIN
25 DEUTSCHES REICH 25
ISLAND
5 AUR 5
1.50 LIECHTENSTEIN FR.
PRO JUVENTUTE 1929
20 HELVETIA 20
TASMANIA
1d MOUNT WELLINGTON 1d
NEW ZEALAND
2½d

British captured certain cities they seized the stamps and over their faces they printed in black ink, V.R.I. (Victoria, Queen and Empress) and the value, halfpenny, penny, etc., as required. Here is a stamp with a history, a stamp no longer being printed, and, therefore, a stamp that becomes more valuable as the time goes on.

THE PAGEANT OF HISTORY IS WRITTEN ON THE WORLD'S STAMPS.

Not many hobbies suitable for young people are capable of becoming good investments later on, but stamp collecting is one—and if you collect now you will find the increasing years put a value on your stamps.

Wars come and go, empires fall and republics arise. Kings' heads disappear from postage stamps and those of dictators appear —so the stamps bear a record of world upheavals, re-distribution of land and the rise of new governments.

What a fascinating hobby it is ! Collectors who started years ago, before the Great War of 1914-1918, must be very proud of their albums. Here are stamps of Servia, Montenegro, Bosnia, German West Africa, the Russia of the Tsars and other states and countries that have nowadays changed their governments or become merged in other kingdoms or republics.

The stamps of the olden times are silent witnesses of that which has passed away. The Portuguese stamps no longer carry the bluff, fiercely moustached face of the king, nor do the Spanish stamps show us the various stages in the growth of Alfonso—till lately monarch of this land of sunshine. Ireland gives us new stamps in a language foreign to us, and a newcomer to our albums appears in the shape of the air-mail stamp — from envelopes carried by aeroplanes from country to country.

And how may we begin, you may ask ? The first thing you need is a stamp album, these may be had from a modest shilling or two up to an amount which will be far beyond your purse. They may be obtained through good booksellers or direct from the better-known stamp dealers. Advertisements of stamps and albums are to be found in many boys' and girls' magazines, and some of the firms advertising will prove themselves very helpful if you write them. Remember, good dealers in postage stamps are glad to have young people interesting themselves in the hobby of philately and will provide information, advice and particulars of very cheap stamp albums, stamp mounts and other accessories.

HOW DOES ONE BEGIN TO TAKE UP THE HOBBY OF PHILATELY ?

Dealers send to inquirers what are termed *approval sheets*, on which actual stamps are mounted, and each stamp is priced. The purchaser detaches the stamp required and returns the rest with the price of the stamps he has retained. Collections of stamps in packets may also be obtained, and the dealers issue lists and catalogues of such collections. You may buy stamps with your spending money, as the price of some of them is as small as a halfpenny.

Stamps are mounted in the albums by stamp mounts. These are simply strips of gummed paper. The strip is folded in half, gummed side out, and while one half is attached to the back of the stamp the other is stuck to the page in the album. Thus the stamp is hinged on the page, and may be raised like the lid of a desk, so that its price or other particulars such as date of purchase, etc., may be written in the square underneath. The stamp may be removed uninjured if desired. Never paste or gum down your stamps. Hinge them with stamp mounts and they will not suffer damage. So begin this fascinating hobby now. It will become more entrancing as you grow older, and will increase your general knowledge.

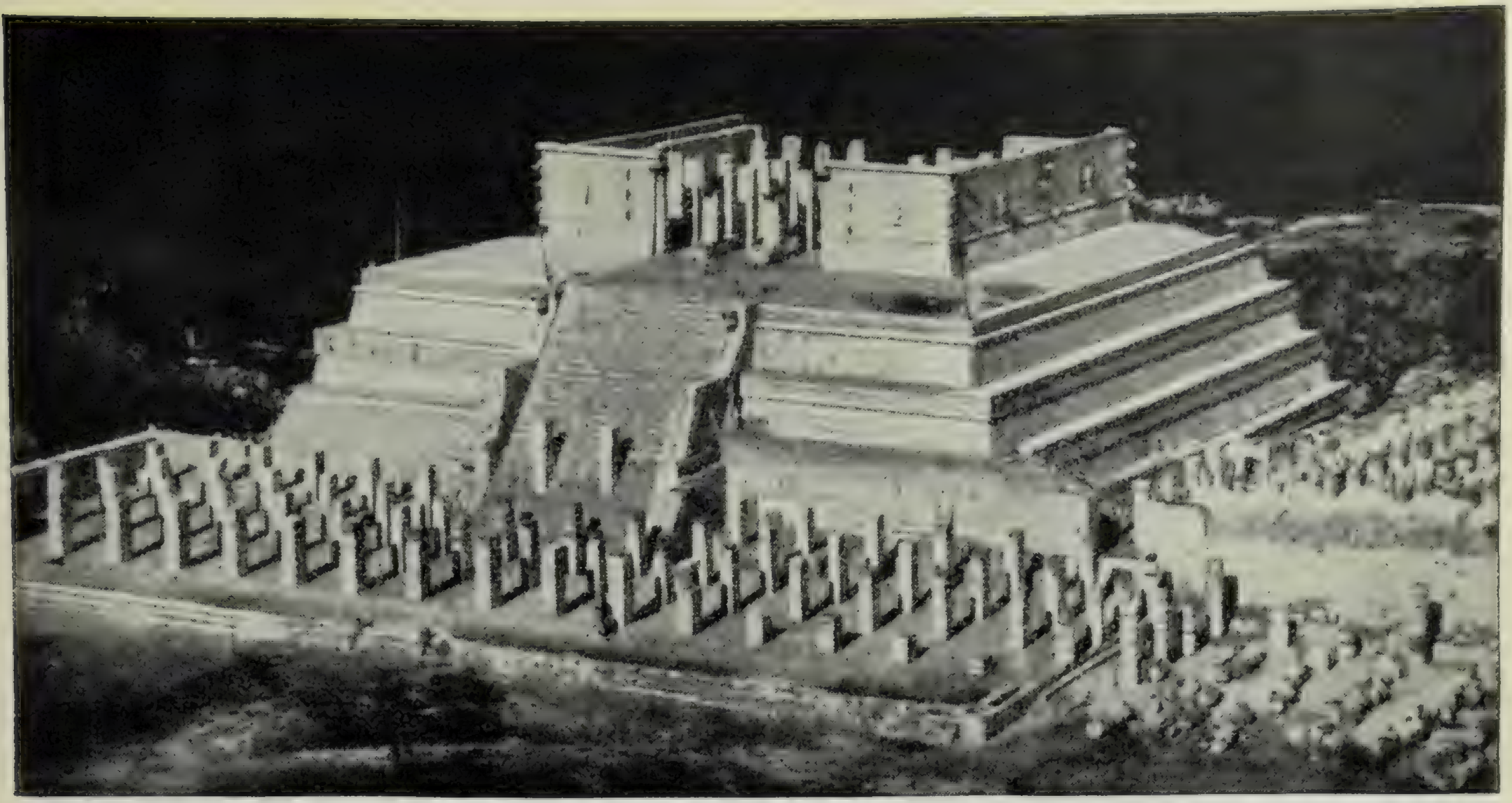
PORTRAIT STAMPS ; KEY TO PAGE 140.

Reading from left to right, commencing top line

Austria	Schubert
Germany	Schiller
Germany	Frederick the Great
Austria	Beethoven
Poland	Kosciuszko, Washington and Pulaski
Italy	Dante
Italy	Leonardo da Vinci
Belgium	Rubens
Holland	Rembrandt
Cook Islands	Captain Cook
Greece	Byron
Newfoundland	Princess Elizabeth
Roumania	Ex-boy-king Michael
France	Joan of Arc
Barbados	Nelson
St. Kitts-Nevis	Columbus
Italy	Julius Caesar
Poland	Chopin

SCENERY STAMPS ; KEY TO PAGE 141.

Czecho-Slovakia	Tatra Mountain Scene
Andorra	The Valley of Andorra
Japan	Mount Niitaka
Norway	North Cape and Midnight Sun
China	The Great Wall of China
Gibraltar	View of the Rock
Jamaica	Valley Scene
Jamaica	Llandovery Falls
Tasmania	Lake Marion
Colombia	Emerald Mine
Southern Rhodesia	Victoria Falls
Liechtenstein	Valley of Samina
Germany	Heidelberg
Iceland	Gullfoss Falls
Liechtenstein	Mountain Scene and Club Hut
Switzerland	Mt. Lyskamm
Tasmania	Mount Wellington
New Zealand	Mt. Earnslow and L. Wakatipu



This fine building, the Temple of the Warriors, was found in a Central American forest. [*Carnegie Institution, Washington*

WHAT THE SPADE HAS REVEALED

Man's curiosity has ever led him to probe into the past and make guesses as to the future. We all love to discover new knowledge, and learn what the world was like in olden days. Much of our recorded history is the result of patient spadework by excavators, on the sites of ancient cities and temples. Below are given accounts of four parts of the world where such searchings into the past are being carried out. The forests of Central America cover ancient cities of the Maya race. The sands of the Egyptian desert roll over the tombs of ancient kings, while the grass grows where once high priests burned incense. The spade, slowly but surely, is uncovering these hidden records of life as it was lived in days gone by.

SECRETS OF THE TROPICAL FORESTS

IN the dense, tropical forests of Middle, or Central America, there have been unearthed the remains of what were once mighty and flourishing cities. Up to the present nearly a score of such ruins have been found in the Yucatan peninsula of Mexico and in the adjoining territories of Guatemala and Honduras. Furthermore, these mysterious cities of a forgotten race are continually coming to light. One, known as Calakmul, was only discovered in 1931.

It was the *chicleros*, or chewing-gum hunters, who reported its existence. Indeed, these wonderful ruins, hidden away in the deep recesses of the jungle, have nearly all been discovered by these men whose business it is to search for the *chico-sapote* tree, the milk of which, boiled, solidifies into pure chewing-gum. Were it not for the American craze for this article, many of these ruins would have remained unknown. The Carnegie Institution of Washington, which has done more than any other scientific body in exploring these ruins, has a standing reward to all *chicleros* for information leading to the discovery of any new group of ruins. Neither could the modern scientists reach the ruins and study them without the help of these men. They blaze the trail, establish camps, and transport all needed food supply and material by means of mule trains, the only method of transport in these wild regions.

The ruins, which invariably take the form of a group of massive stone-built erections, consisting of temples, palaces and courts, adorned with elaborate and delicate carvings, would seem almost to rival those found in Egypt and elsewhere. They are the creation of a race known as the Maya, who dwelt in this section of the American continent long before the time of Christ. The Mayan Indians of Mexico to-day are descended from them.

That is all the more remarkable when we remember the high state of civilisation attained by this ancient race. When Europe was plunged in the depths of barbarism, the priests and astronomers of the Maya were gathering from the stars the secrets of time and its accurate measure. Their mathematicians were working out a calendar and system of time-measurement without equal in Europe at that time; their builders were developing an architecture at once unique and beautiful; their sculptors were carving the most elaborate compositions and designs in stone; their leaders had mastered the problem of how to form an orderly social community and were governing the state wisely and well. It will thus be seen that the Maya were a highly civilised and cultured race.

The ancient Maya sculptors carved this monument, now fallen, in the forests of Central America. [*Carnegie Inst., Washington*

Long before Columbus discovered America and the early Spanish adventurers visited its shores, the stone-built cities of the Maya had been deserted. Yet records would show that for a period of at least six hundred years before Christ, and for almost a like period afterwards, Mayan art flourished. Historians divide their history into two parts: the Old Mayan Empire, which lasted up to the time of Christ, and is represented in such ruins as those found at Tikal, Copan, and other magnificent and temple-adorned cities found in Honduras and the southern part of the Yucatan peninsula; and the New Empire, as portrayed by such ruins as Chichen Itza and Uxmal in the northern section of the Yucatan peninsula.

As already stated, Mayan remains have been found at something like twenty different places, but only a few can be said to have been thoroughly examined and explored. Here we must remember that not only are the ruins hidden away in the deep recesses of the jungle, but when first discovered they are invariably nothing more to the eye than mounds covered with trees and thick undergrowth, a piece of protruding stonework at some point proclaiming to the trained eye that buried here is some ancient treasure. The first task of the explorer then is to clear away the rubbish, work which may occupy not months, but two years or more. This means that a special camp has to be established in the heart of the jungle, to which all supplies and tools have to be brought long distances on the backs of mules along specially cut trails in the dense forest.

During the past five or six years quite a number of expeditions have been sent into these tropical forest regions of Central America by the various learned societies with a view to learning something of the mysteries of these buried cities. British excavators have done valuable work among the ruins so far found in British Honduras, and the British Museum regard the subject as of such importance that they have devoted a special room to Mayan relics.

No society, however, has done more in this direction than the Carnegie Institution of Washington. Not content with merely uncovering the ruins, they have spent considerable sums in restoring them, thus enabling us to see something of the grandeur and

This photograph of the lost city of Chichen Itza, taken from the air, shows the Ball Court, El Castillo, and the Temple of the Warriors. Until recently the dense jungle hid these ancient buildings. [*Carnegie Institution, Washington*

beauty of these lost cities. This has been their policy in regard to the ruins of Chichen Itza, Uaxactun and Tayasal. These three sites cover the entire range of Maya history; Uaxactun is, on the basis of recorded dates, the oldest Maya city; Chichen Itza was founded before the abandonment of Uaxactun and was occupied shortly before the coming of the Spaniards; Tayasal, independent stronghold of the Maya, did not fall until the close of the seventeenth century.

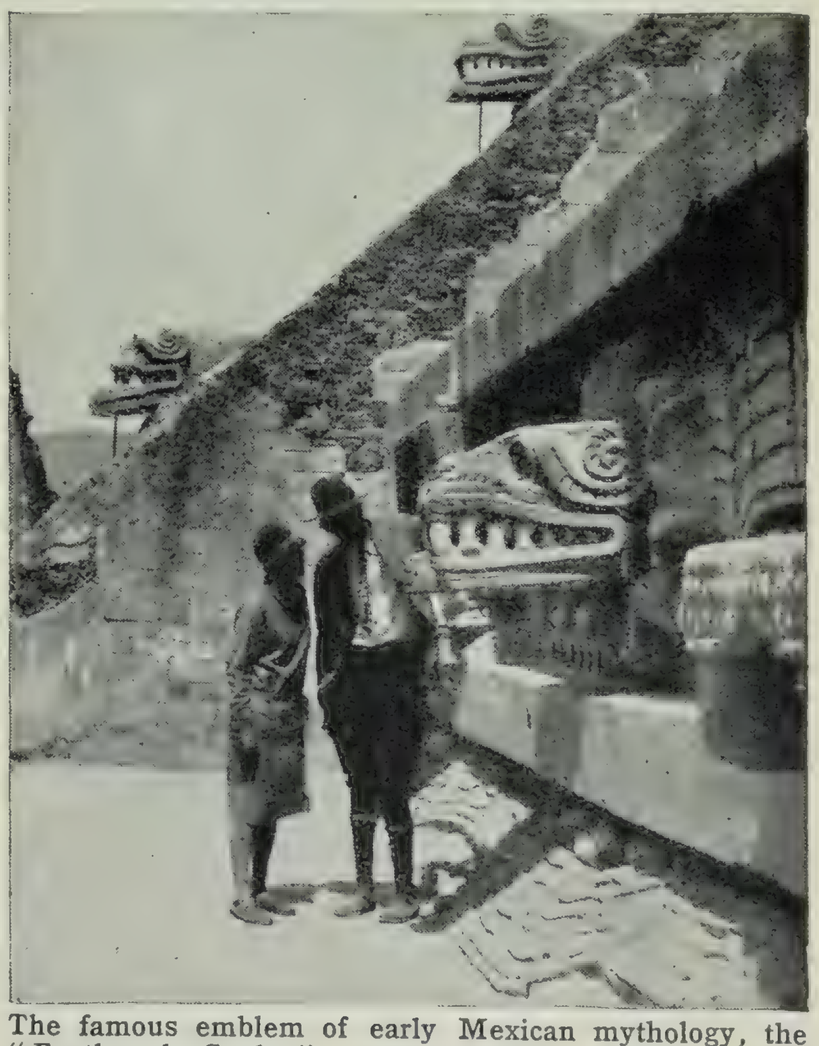
DIGGING UP LOST CITIES AND DISCOVERING QUAINT RELICS.

Chichen Itza was selected for the Institution's chief effort for several reasons. The city was founded before the close of the Old Mayan Empire, and can therefore be expected to throw light on the earliest phases of the New. During the latter period it was a leader both in politics and religion. It contains more inscriptions in picture-writing than any of the later ruins. It was so long inhabited that it gives opportunity for studying Mayan art and the development of the Maya race through many centuries. Its remains are abundant, full of interest, and well preserved. A band of scientists have been at work upon these ruins since 1924, and the work is still going on.

At Chichen Itza we have a dozen or more large buildings which were devoted to a variety of purposes—temples for worship, a nunnery, an observatory, a court, and colossal pyramids. They are in every sense of the term great edifices, wrought in stone and fashioned out of simple stone tools, for the Maya did not know anything of the value of metals. Some of the blocks used in their buildings were of immense size and weight. The largest single stones used at Chichen Itza were carved serpents' heads, weighing no less than seven tons apiece. To have transported such blocks from the spot where they were quarried, without wheeled vehicles or beasts of burden, was a formidable task, but certain it is that it was done. A greater problem was the raising of these huge blocks in position, no doubt accomplished by the use of ropes and man power. But in the Mayan ruins we find much larger blocks than the 7-ton serpents' heads. At Quirigua, in Guatemala, there is a stela, or monument, weighing no less than forty-five tons, which had to be brought from quarries five miles distant.

THE TEMPLE OF THE WARRIORS—A STRIKING EXAMPLE OF MAYAN ARCHITECTURE.

Take the recently restored Temple of the Warriors at Chichen Itza as an example of Mayan architecture. In 1925 it was nothing more than a tree-covered mound of rubbish rising fifty feet above a thickly wooded plain. To-day, after seven seasons' labour on the part of the archaeologists, we have an extraordinary but imposing building, at one time the sanctuary of a highly cultured people. The Temple proper rests upon a foundation shaped somewhat like a pyramid, and adorned with rich carvings of feathered rattlesnakes, eagles, jaguars and warriors.



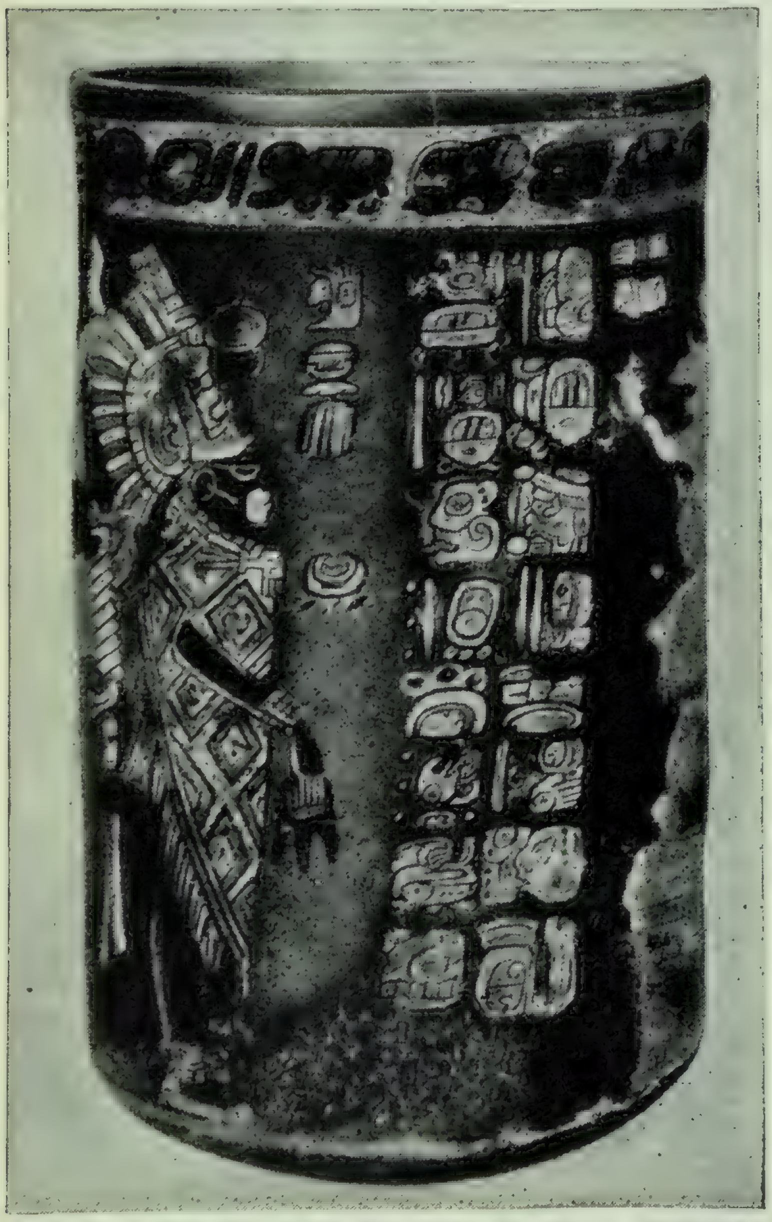
The famous emblem of early Mexican mythology, the "Feathered Snake," attracts much attention from tourists who visit San Juan, Teotihuacan. Two admirers are examining this peculiar sculpture with interest. [*Carnegie Institution, Washington.*

The interior also is richly adorned with sculptures and wall-paintings, and in front of the doorway is a life-size human figure representing one of the gods worshipped by this ancient race.

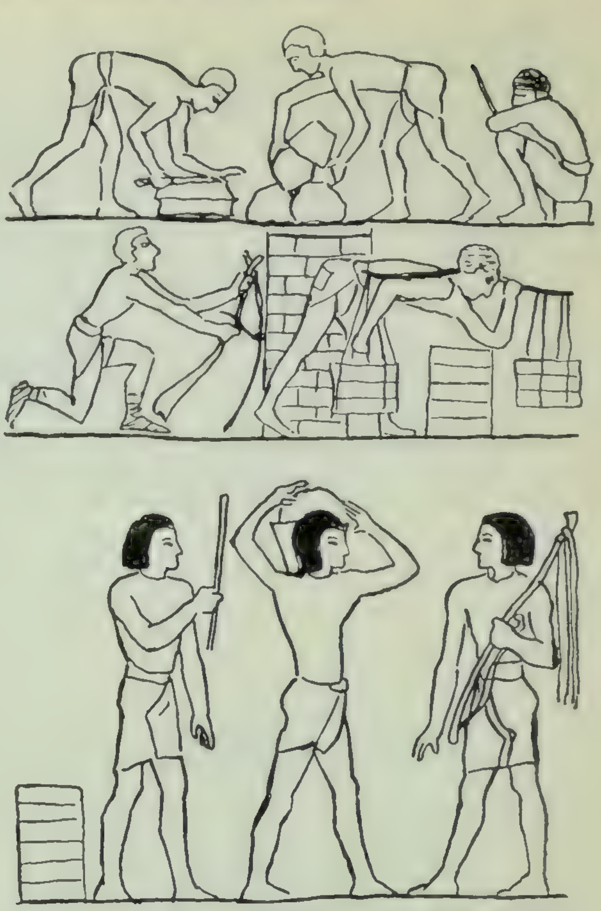
DISCOVERIES WHICH SHOW THE WONDER OF ANCIENT MAYAN HANDICRAFT.

In addition to restoring this and other important buildings at Chichen Itza, many interesting discoveries were made throwing valuable light upon the culture of this forgotten race. In addition to the artistic creations which adorned their principal buildings, they put up monuments covered with hieroglyphic inscriptions reminding one of those found in Egypt. Pottery articles, adorned with lovely designs, have been found. It is evident, too, from their vivid and life-like stone pictures that their priests and head men wore splendid and elaborate garments.

The Maya worshipped many gods, one of the chief of these being the Corn God. Blood figured in their sacrifices. At first they contented themselves with what they called the "penitential rite," when their priests pierced their ears and tongues, and so offered blood from their own persons. In the British Museum may be seen the cast of a sculpture depicting a Maya priest making such an offering of blood before his god. He is seen kneeling in front of the god in the act of drawing across his tongue a rope studded with thorns. Later the Maya resorted to human sacrifices, and they were practising these inhuman rites when their culture appears to have come to an end.



Above we see the most important specimen of Mayan pottery that has been discovered. This cylindrical jar bears to the right of the figure two columns of date hieroglyphics, the first ever found on any medium other than stone or stucco. [Carnegie Institution, Washington



On the tombs at Thebes, ancient Egyptian sculptors have carved pictures of slaves making bricks, while taskmasters stand over them with whips and staves.

A CLUSTER OF TEMPLES BUILT LONG AGO BY HARD-WORKING SLAVES.

Exactly what happened to have caused such a high state of civilisation to fall we can only guess. To have heaped up the great cluster of temples now visible at Chichen Itza, and the even greater number which have been destroyed by time, one concludes that the Maya employed slave labour. In the midst of this excessive building by forced labour came a series of hurricanes, crop failures and epidemics. The discontented workers may have scattered into the forests and found there sufficient sustenance, while the Maya civilisation with all its arts and culture collapsed and was unable to rise again before the appearance of the white man.

AMONG THE SAND-COVERED TOMBS OF EGYPT

A LITTLE over a century ago the past of Egypt was a sealed book. True, the pyramids still stood four-square to the sandstorms of the desert as they had stood for ages, the Sphinx regarded the Nile with the same inscrutable gaze that had puzzled the ancients. Throughout Egypt were mighty ruins, but little was known about them.

They dotted the valley of the Nile all the way from Cairo to Luxor and beyond, a distance of over six hundred miles. People used to visit these relics on the backs of donkeys and what they saw were partially-buried temples, great piles of stones, broken statues and shattered columns lying about in the utmost confusion. Here and there in the shifting sand stood strange and mysterious columns, some so strangely shaped that their like was not to be seen elsewhere. It all added to the mystery of Egypt and many myths arose about them.

The ancient Egyptians believed in beautifying their tombs with many wonderful carvings. Here we see a wall of the tomb of Ptah-hotep, showing exquisite designs of birds and beasts and carved Egyptian figures.

Then came the archæologist who, with spade and pick, not only uncovered these mysterious ruins, but was able to read their history, and what a wonderful story it has proved. Foremost among this band of scientists stands the name of Sir Flinders Petrie, who may be said to have spent a life-time excavating and exploring the ruins that dot the banks of the Nile. The Egyptians say of Sir Flinders that a fragment of pottery, which the ordinary person would look upon as worthless, is to him a calendar, enabling him to date a ruin and tell with wonderful accuracy the civilisation of that period.

THE HUNTING GROUND OF HISTORIANS. THE ANCIENT LAND OF MONUMENTS AND TOMBS.

Until fairly recently it was believed that the civilisation of Egypt dated back about 5000 years. Then one day Sir Flinders Petrie came across remains of a very ancient grave, carrying the civilisation of the country back nearly 10,000 years! In dealing with the lapse of such ages it is, of course, difficult to mention any definite dates, and that is the reason why the archæologists refer to Dynasties, starting with the First Dynasty, and working up to the last or Thirtieth Dynasty. (A dynasty, we may note, is a succession of rulers belonging to the same family.)

Egypt's most wonderful monuments are her tombs. The oldest monument in the world, in fact, is a tomb, and it is to be found in Egypt, namely, the Step Pyramid, so named because it rises in the form of steps, each one measuring over thirty feet in height, the whole towering 197 feet into the air and having a base over 350 feet square. When Christ was a babe in Bethlehem this strange pile had already been standing 3900 years, for it is nearly 6000 years old.

WHAT IS THE SECRET OF MASSIVE EGYPTIAN PYRAMIDS—THE SENTINELS OF TIME?

But Egypt is a land of Pyramids. There are nearly eighty of these monuments of different sizes scattered throughout the Nile valley. The greatest and most renowned of them all is the Great Pyramid of Gizeh, just outside Cairo. It was erected by Cheops over 5000 years ago as his tomb. It has a base of 764 square feet, equal to the area of Lincoln's Inn Fields, in London, and rises to a height of 480 feet, exceeding that of St. Paul's Cathedral and St. Peter's in Rome. It has been calculated that there is over seven million tons weight of stone in this single structure, sufficient material to build a city containing twenty-two thousand houses four and five storeys high.

The marvel of the Great Pyramid to the scientist is that its sides face exactly north, south, east and west, without any deviation whatsoever. Some people believe that the Pyramid is the building spoken of in the Bible in the nineteenth chapter of the prophecy of Isaiah, verse 19. Here it is written: "In that day there shall be an altar to the Lord in the midst of the land of Egypt, and a pillar at the border thereof to the Lord." In what has been termed the Gizeh Field, where rise three great Pyramids, the existence of a fourth was recently found, built by a queen of the Fifth Dynasty of the name of Khent-Kawes, who bore the title of "Queen of Upper and Lower Egypt." At the entrance to the pyramid were found several inscriptions, and under them the queen is shown seated on a throne holding in her hand a sceptre, and on her head a crown decorated with a vulture, an emblem of Upper Egypt, and a serpent, an emblem of Lower Egypt. Her tomb, like so many others found in Egypt, had been pillaged by thieves in ancient times.

THE MYSTERIOUS SPHINX—WHICH HAS WATCHED OVER EGYPT FOR SO MANY CENTURIES.

Lying about a quarter of a mile from the Great Pyramid is the Sphinx. Nobody knows exactly what it represents, and the most learned investigators are uncertain as to its origin and age. It is believed, however, to represent the sun god Ra, and is probably older than the pyramids. Until a year or two ago it was partially buried in the sand. The debris was cleared away by the Antiquities Department of the Egyptian Government, work which occupied an army of eight hundred Egyptian boys and girls six months. This remarkable monument was hewn partly out of solid rock and partly built up with stones. From the fore toes to the end of its quarters it measures about 240 feet in length and stands some 65 feet in total height. From crown to chin the face measures 33 feet. The mouth is 7½ feet across, the nose 5½ feet long and the ears 5 feet.

Journeying north by river we pass the temples of Denderah, the rock temples of Abydos and Beni-Hassan, and many other ruins till we come to Luxor. At Beni-Hassan, which is some 150 miles above Cairo, there was recently found a wonderful carving, representing a family being taken into the presence of the king. It is the belief of many scholars that this portrays Abraham's reception at the court of the then ruling Pharaoh.

COLOSSAL MONUMENTS AND MIGHTY OBELISKS LOOMING OVER LUXOR.

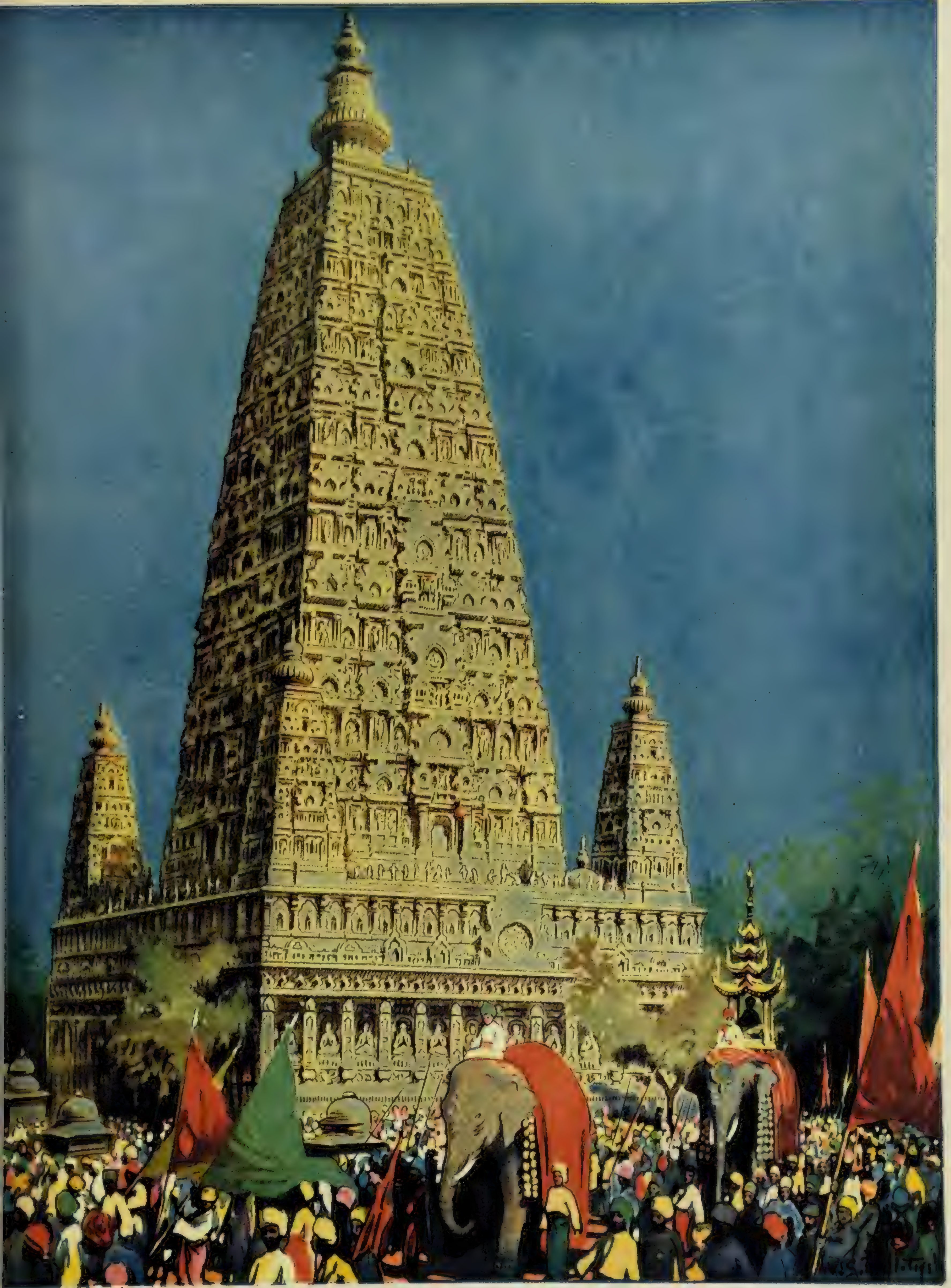
At Luxor one is in the midst of some of the most wonderful ruins in the world, for here stood mighty Thebes. It has been the scene of considerable exploration work by some of the greatest scholars of the day, and as a result we have learnt many startling facts about its history. It is alluded to in the scriptures by three prophets—Nahum, Ezekiel and Jeremiah—under the name of No. It was a city of temples, whose forms and whose columns were the origin of early Greek architecture, and therefore of all the architecture of the world. In it was founded the first college, and it was at Thebes that the first circulating library was established. Architects are agreed that the palace temple of Karnack, at Thebes, must have been the most wonderful building the world has ever seen. It was larger and grander than any cathedral. We can see its ruins to-day, as well as those of the temple of Luxor, in addition to beautiful gateways, mighty obelisks and colossal monuments.

On the other side of the river we have other gorgeous temples, far too numerous to mention here, and at the foot of the hills the tombs of the Pharaohs, this spot now being alluded to as the Valley of the Kings. It is here that the resting place of King Tutankhamen was found by Mr. Howard Carter and Lord Carnarvon in 1922. This region has been the hunting ground of archæologists for the past thirty years and more. You could wander about here for a week and not see half its glories.

THE VALLEY OF THE KINGS, WHERE THE ANCIENT PHARAOHS REST IN THEIR CARVED TOMBS.

The most remarkable of the temples here is that of Queen Hatasu or Hatshapet. She is believed to have been the Pharaoh's daughter who rescued Moses. A picture was discovered recently of this time showing a number of men like Israelites making bricks under the supervision of a taskmaster. When Hatasu was queen she displayed wonderful ability. She had a man's mind, and has reminded posterity of that fact, for in her statues she is seen wearing a man's beard.

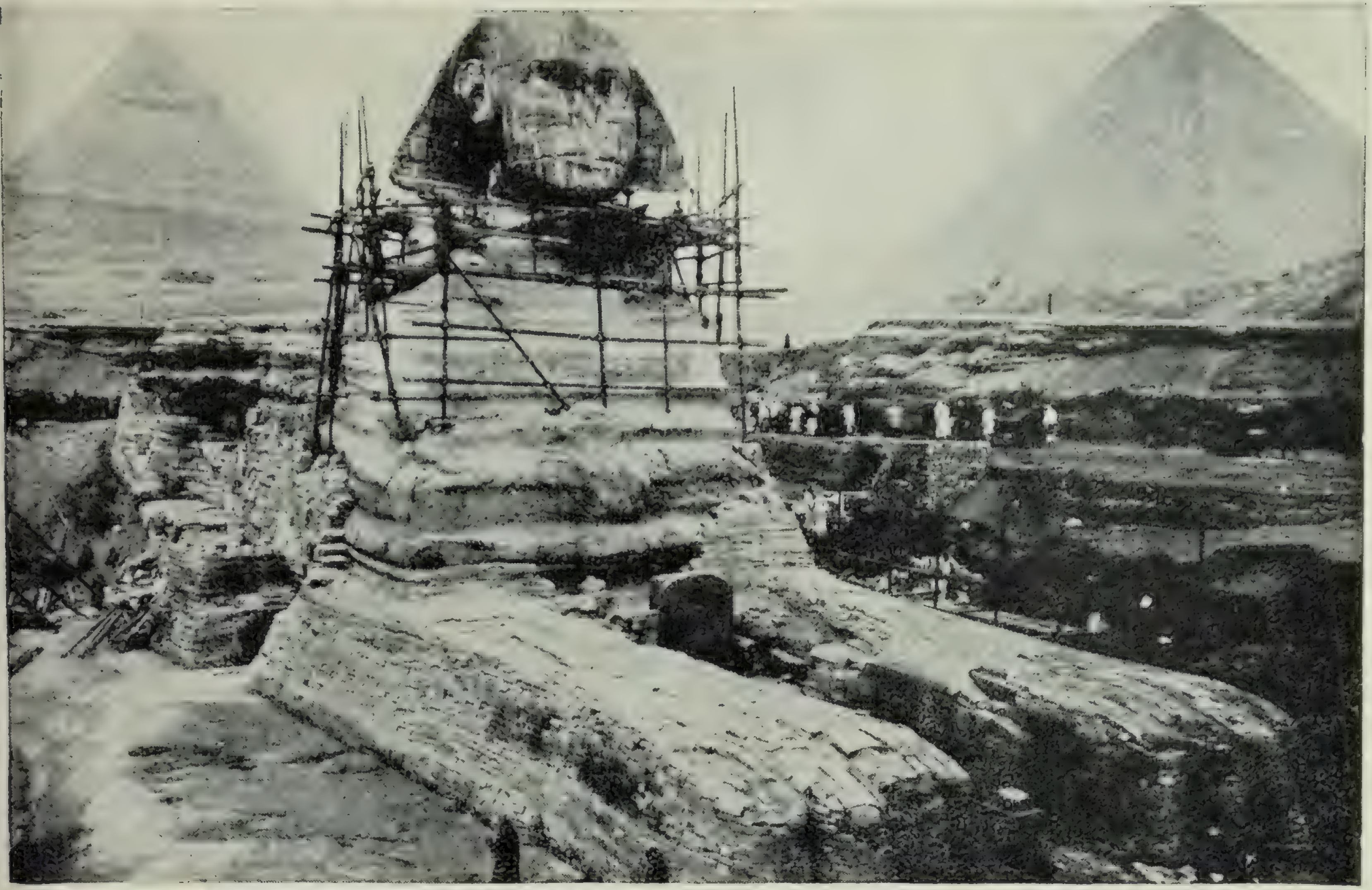
Lord Carnarvon has told us that in uncovering the tomb of Tutankhamen some 70,000 tons of rubbish had to be removed, which gives some idea of what excavation work in Egypt means. They had been digging for many weeks and Mr. Howard Carter had declared that he would dig just one more day, and if nothing turned up then he would stop. Before the day's digging was over they encountered a step leading to the mouth of the tomb. A yard or two to the right or left and they would have missed the object of their search. It was a much nearer thing than the world imagines. But the finding of this tomb was the most remarkable archæological discovery of recent times. Not only were the mummified remains of Tutankhamen found, but his resting place was found to be crowded with funerary furniture, including his throne, stool, golden bedstead, chest, chariot, caskets, candlesticks and numerous other articles—many of them not only beautifully and artistically modelled but covered in gold.



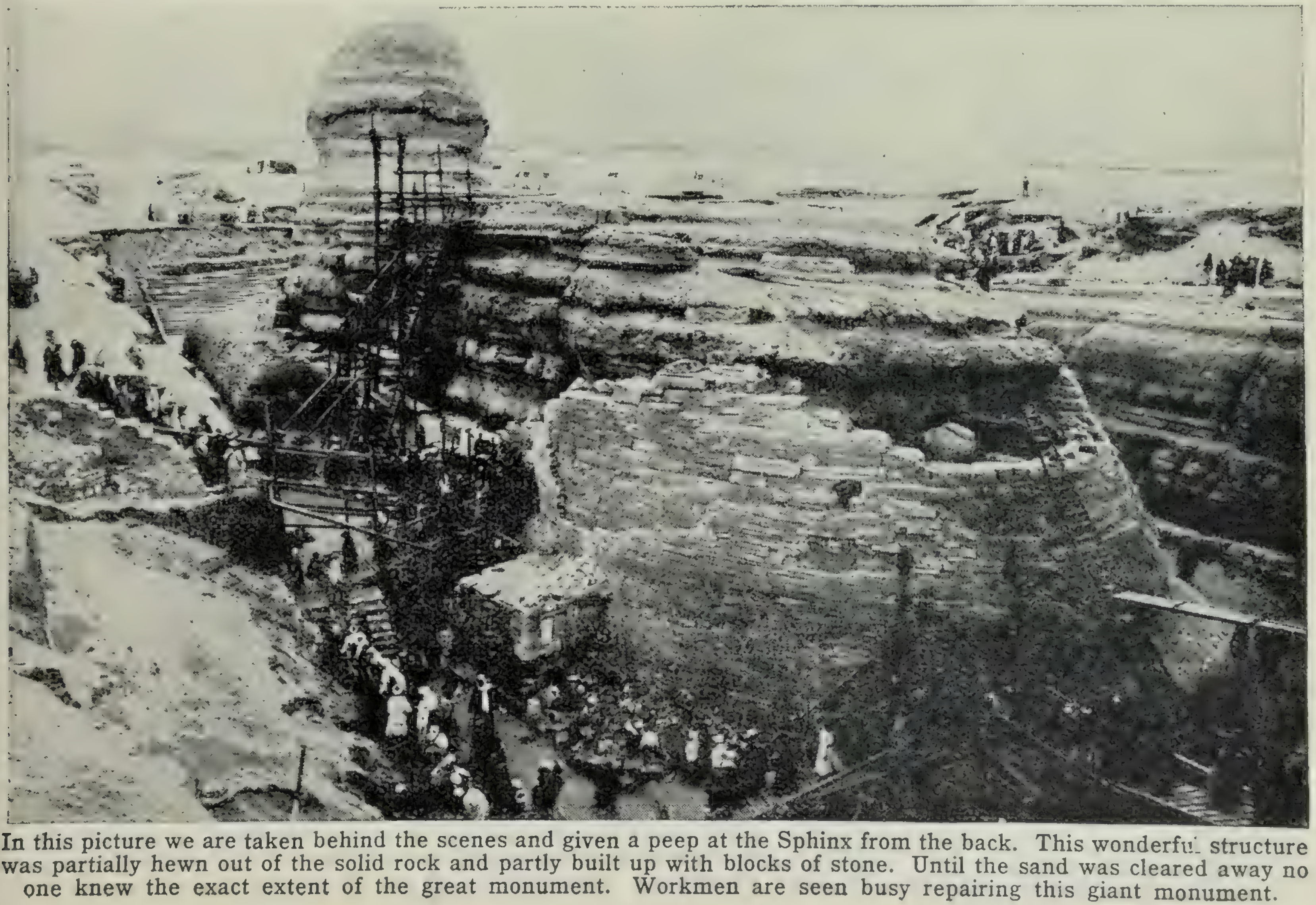
AN EASTERN HOLY OF HOLIES.

The temple of Budh Gaya, a wonderful example of the work of Hindu craftsmen, marks the spot where Buddha, prince and religious teacher, was inspired to found the religion which bears his name. [*Indian Rlys.*

EYES THAT STARE THROUGH TIME UNBLINKING



The beauty specialists get busy on the Sphinx! This marvellous monument, which is the centre of attraction for tourists in Egypt, requires careful handling when it is being repaired. Only the very necessary renovations for its preservation are undertaken, so that the original structure will be disturbed as little as possible. Above we see the scaffolding being carefully removed by workmen after one of these operations. A temple once existed between the great paws.



In this picture we are taken behind the scenes and given a peep at the Sphinx from the back. This wonderful structure was partially hewn out of the solid rock and partly built up with blocks of stone. Until the sand was cleared away no one knew the exact extent of the great monument. Workmen are seen busy repairing this giant monument.

Tutankhamen's father-in-law was the famous Pharaoh, Amenhotep IV. He caused a revolution by denouncing all the gods of Egypt—and they were many—and substituting the worship of Aten, or the rays of the sun. He was forced to leave Thebes and build another city, Tell-el-Amarna, a hundred miles farther south. There were dug up among the ruins here a number of tablets, among them letters from the vassal chiefs of Palestine, begging for military assistance against a new enemy, "the Habrai," which scholars believe were the Hebrews or Israelites. But Amenhotep was too busy with his new religion to bother about these appeals, with the result that the children of Israel were enabled to settle in the land of Canaan. Thus are the pick and spade revealing to us some of the mysteries of ancient Egypt, and in a wonderful way excavation is confirming the Bible story.

ANCIENT UR, CITY OF ABRAHAM, COMES TO LIFE

In the British Museum in London are some exceedingly interesting exhibits from Ur of the Chaldees, the place from which Abraham went forth at the command of Jehovah. There are wonderful mosaics, or specimens of inlaid work, which depict the manners and customs of the people of those far off days; monuments, statues, weapons and interesting inscriptions.

The uncovering of the ruins of this ancient city forms one of the most fascinating chapters in the history of archæological investigations. It was nearly five thousand years ago that Abraham sallied forth from Ur with his flocks and herds to found a new nation. Here it must not be forgotten that Ur was ancient when Abraham left it. Indeed, some scholars speak of Ur as the oldest city on earth.

HOW ONE OF THE OLDEST CITIES ON EARTH WAKES AFTER A LONG SLEEP.

Be that as it may, we are now enabled to read something of its past history. Not only has the city of Abraham's birth been definitely located, but a portion of its ancient walls and old gates have been laid bare, as well as its most sacred enclosure on which stood the Temple of the Moon God and other sacred shrines. More startling still has been the discovery of the royal tombs of Ur, where its kings and queens, who reigned thousands of years before Christ, were buried. Here were found treasures of gold and silver, wonderfully carved and engraved objects of art, telling of a high state of civilisation.

Among the many exquisite treasures found in the royal tombs of Ur, where ancient kings and queens were buried, this Prince's golden helmet, in the form of a wig, was unearthed. It is treasured as a priceless ancient relic.

WAS IT HERE THAT OUR FIRST PARENTS WALKED IN THE GARDEN OF EDEN?

The excavations have been carried out by the British Museum and the Museum of the University of Pennsylvania, under the leadership of Mr. C. Leonard Woolley. The site of Ur to-day is a desolate region of sandy mounds in the valley of the Tigris and Euphrates, not far from the spot where legend places the Garden of Eden. Here the excavators came across the Temenos, or sacred district of the city. It was a quarter of a mile long, and an eighth of a mile wide, and was entered by a number of gates. Upon it stood the ziggurat, a great artificial mound of brick whose crown was graced by the Temple of the Moon God. Here the priests went through the daily rite of feeding the Moon God and his wife. Here came the faithful with offerings of precious metals, which were stored in an adjoining treasury house (some of the treasure has been recovered). It was to this spot that the elders came in time of common peril to consult the oracle, and here stood the great Gate of Justice, where the king sat when he was interpreting the law. The ziggurat, which was 195 feet long and 100 feet high, must have been a conspicuous object for miles in the flat landscape.

An interesting find in the Temenos district was the museum of antiquities, probably the first of its kind in the world. The annals of Ur show that it was started by Nabonidus, son of Nebuchadnezzar. He is looked upon as the first archæologist, for he loved to dig up ancient records and inscriptions, and when he

This strange-looking creature, with its peculiar yet perfectly-finished carvings, was discovered by excavators in a royal tomb at Ur, where ancient kings were buried with highly-decorated ornaments around them.

built the palace of Gig-Par-Ku for his daughter he set aside one big room as a museum. That first museum, an interesting symbol of man's eternal quest into the story of the past, was quite as elaborately planned as are our museums to-day. It contained statues and objects all duly labelled after the manner of exhibits in our own museums.

FROM THE EARTH HAVE COME PICTURES OF LIFE IN THE DAYS OF ABRAHAM.

Ur is rich in houses that were standing in the days of Abraham, and a great many have already been uncovered. They were well built of burnt brick, two storeys high, boasting of a central court with a wooden gallery running around it. The excavators were enabled to date and classify many of the relics found from the fact that the kings of Ur were in the habit of stamping the bricks used in their buildings with their names.

In the same way we learn about the art and social customs of the citizens of Ur. Among the ruins of the Temple of the Earth Goddess was found a sculptured ox, done in copper, which is almost certainly the oldest animal statue in existence. In another corner of the temple the excavators found a curious old statue of a bird, which is just as surely the oldest bird statue ever discovered. Both statues were made by men who at the very latest could not have lived and laboured later than 4300 B.C. Curious wall drawings and friezes illustrate the method of teaching the young the importance of dairying. One such frieze shows the method of milking. We also note how the milk was strained and stored in big jars. In a like manner we have mosaics showing the kings of Ur at their banquets, hunting scenes and the like.

THE KINGS OF FIVE THOUSAND YEARS AGO WERE TRULY REGAL IN THEIR SPLENDOUR.

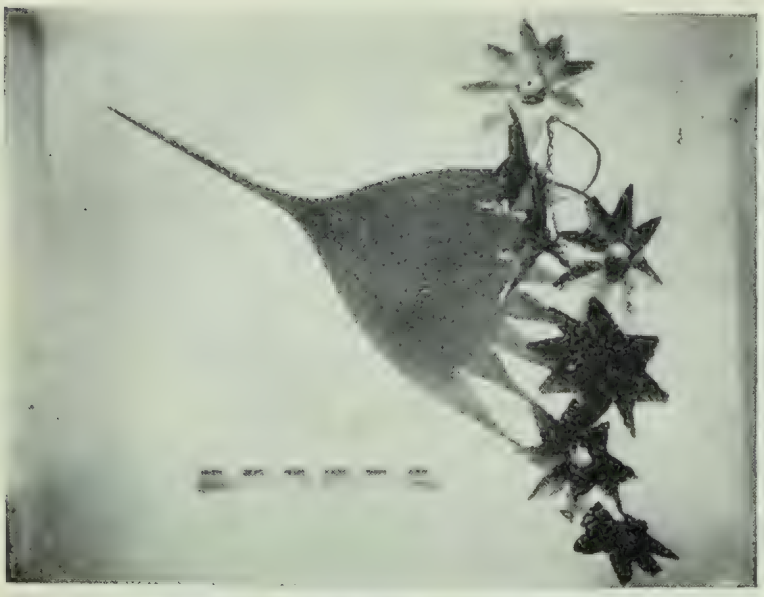
The most remarkable discovery was that of the royal tombs. The first one entered was that of King Mes-Kalom Dug, who reigned 3300 B.C. His body was not there, and it is surmised that his tomb had been plundered by robbers shortly after his burial. Among the objects found were the remains of a chariot; a harp overlaid with gold; saws and chisels; vases, jars and other articles, many of them wrought in gold and richly engraved.

However, the tomb revealed the barbarism of the age, for it contained, besides oxen and bulls, the human remains of some sixty men and women who had been sacrificed so that they could wait upon the king in the next world.

THE ELOQUENT STORY TOLD BY A QUEEN'S GOLDEN COMB.

The tomb of Queen Shub-Ad, the king's consort, was also found, and though little of the earthly remains of the queen were to be seen, a golden head-dress where her head had lain still remained. Originally it was worn over a great wig, of which some of the hair was found. The head-dress was in a remark-

This huge structure is the temple of the Moon God at Ur, the ancient city of the Chaldeans. These pagan people of olden days worshipped the sun and the moon.



This strange comb, decorated with seven teeth or fingers, each ending in a golden flower, was found at Ur of the Chaldeans. It belonged to a famous queen, Shub-Ad.

ably good condition, for it had kept its shape, and coil after coil of gold ribbon wound itself around where the wig had rested. Towering over the top of the vanished head was a golden ornament resembling a Spanish comb—shaped like a hand with seven fingers—each of which ended in a golden flower. And where Shub-Ad's dainty ears had been there were enormous gold ear-rings.

It is scarcely credible that her funeral cloak could have looked better when it was buried with her than it does now. But, alas! the excavators again discovered that about fifty men and women had been slain to assist the queen on her entry into the next world.

These ghastly funeral rites of the ancient kings of Ur astonished archæologists. Babylonian literature had told them nothing of such a hideous custom, while in the graves of private persons of the same period there is not so much as a clay mummy which might take the place of the human victim a poorer man could not afford. The only possible explanation seems to be that kings in those days were looked upon as gods, and that victims were offered to them as gods and not as kings. These discoveries at Ur have completely changed our ideas about the world's oldest civilisation, for the engravings of the many articles found in the tombs display a marvellous culture not previously guessed at.

THE WORK OF THE SPADE IN THE HOLY LAND

IN no country in the world has the archaeologist been so busy as in Palestine, that little land of sacred memories tucked away at the dead end of the Mediterranean. From Dan in the north to Beersheba in the south, the pick of the excavator is to be heard toiling over mounds and sites, digging up relics of a bygone civilisation and throwing valuable light, not only upon the past history of the country, but upon the sacred narrative as well.

WHY DO EXCAVATORS TROUBLE TO PROBE INTO THE PAST?

The fact is, Jerusalem has become the recognised archæological centre of the Middle East. It is the headquarters of several groups of archæologists, the two most important being the British and American. The Holy City's new Museum of Antiquities, now nearing completion, and upon which a sum of £400,000 has been expended, will be one of the most interesting institutions of its kind in the world. It occupies the site where King Edward, when Prince of Wales, encamped when he visited Palestine.

At the present time no less than six different countries are in the field, digging over abandoned mounds seeking for lost Bible sites. The record has been as high as eleven—eleven different nations excavating in a country not much larger than Wales. It is proof of the universal interest taken in this quest to learn something of the past history of the human race.

THE EXCAVATOR IS A PATIENT MAN—AND HAS GREAT KNOWLEDGE OF ANCIENT HISTORY.

Those who imagine that uncovering old ruins is a fairly simple task would be surprised at the qualifications demanded of the modern excavator. He must be acquainted with the past history of the country, be able to recognise the value of any objects found, and possess untold patience and tact in handling the native labourers. In a sense he is like the seeker after gold; he may be successful or he may not. He may toil for a whole season and have very little to show for his labour, or he may strike it rich, and the whole world will echo with his discoveries. There is a thrill in finding the site of an important Bible city, in stumbling upon the palace of an ancient king, the tomb of a noted monarch and the artistic treasures of those far away times.

HEBREW WEIGHTS AND MEASURES FOUND IN THE CITY OF DAVID.

The discoveries made during the last few months are simply astounding. The lost cities of Sodom and Gomorrah have been found and made to reveal their secrets. As a result of patient digging at Jericho, the excavator can now tell us what probably happened to its walls which fell so miraculously before the trumpet-blasts and shouts of Joshua's army. The site of the City of David, that stronghold on Mount Ophel which he captured from the Jebusites has been uncovered, and on or near the site of the House of Caiaphas they have stumbled across a complete series of ancient Hebrew weights and measures.

HOW THE WELL, INTO WHICH ISHMAEL THREW THE BODY OF GEDALIAH, WAS DISCOVERED.

The site of Mamre, where Abraham was encamped when he was visited by the three heavenly messengers, has been found, as well as the library city of Kirjath-Sepher, in Southern Palestine. Mizpeh, to the north of Jerusalem, where Samuel judged Israel for twenty years, has been made to disclose its secrets, and here was found a cistern, believed to be the very well into which Ishmael threw the body of Gedaliah after he had slain him. In Samaria, the ancient capital of the kingdom of Israel, the remains of Ahab's "ivory" palace have been laid bare, while in Beisan have been found the remains of some of the earliest Canaanitish temples yet discovered in Palestine, including the one in which the Philistines hung the armoury of Saul. At Capernaum they have found the remains of the synagogue in which Christ taught and, a few months since, hit upon the ruins of an ancient church under whose altar was located a stone believed to be the very one upon which the miracle of the feeding of the five thousand was performed.

The ladies of Sodom and Gomorrah loved finery. This curious necklace was found in a burial mound. It is made of shells, beads, coloured glass and precious stones.

The Synagogue at Capernaum in which Christ preached so many years ago. The pillars have been raised and the walls of the temple rebuilt from the fallen stones.

WHAT IS THE USE OF DIGGING UP OLD BURIED RUINS IN ANCIENT LANDS ?

These discoveries not only throw light upon the Bible story, but are important historically. The actual sites have been found of many Bible cities which tradition has wrongly associated with other sites. The work of the excavator in the Jordan valley and at Hazor has enabled us to date more accurately the time of the Exodus and the entry of the Israelites into the Promised Land.

Perhaps the most sensational of recent discoveries in this sacred land is the location of Sodom and Gomorrah, on a dreary plain at the northern end of the Dead Sea on the eastern, or other side of the Jordan. The spot is dominated by Mount Nebo, from which Moses viewed the Promised Land. Not only has the site of these lost cities been laid bare, but many interesting finds have been made, including many pieces of jewellery, the workmanship of which recalls those found in the tomb of Tutankhamen. They were worn by the women of Sodom and Gomorrah, who lived 5000 years ago, in the days of Abraham, the first Patriarch.

Sodom and Gomorrah may be said to have been found by accident. Pieces of pottery and glass were found in the Jordan valley, among some hillocks or mounds, locally known as "tells." The discovery was unexpected, and a surface digging at the spot revealed the presence of worked flints, fragments of mortars and grinding-stones. Preparations were then made for a more thorough search when the remains of a lost city was brought to light, which subsequent examination proved to be none other than Sodom, the city in which Lot took up his residence after his departure from his uncle Abraham.

THE EXCAVATOR GIVES US A BACKWARD GLIMPSE THROUGH TIME.

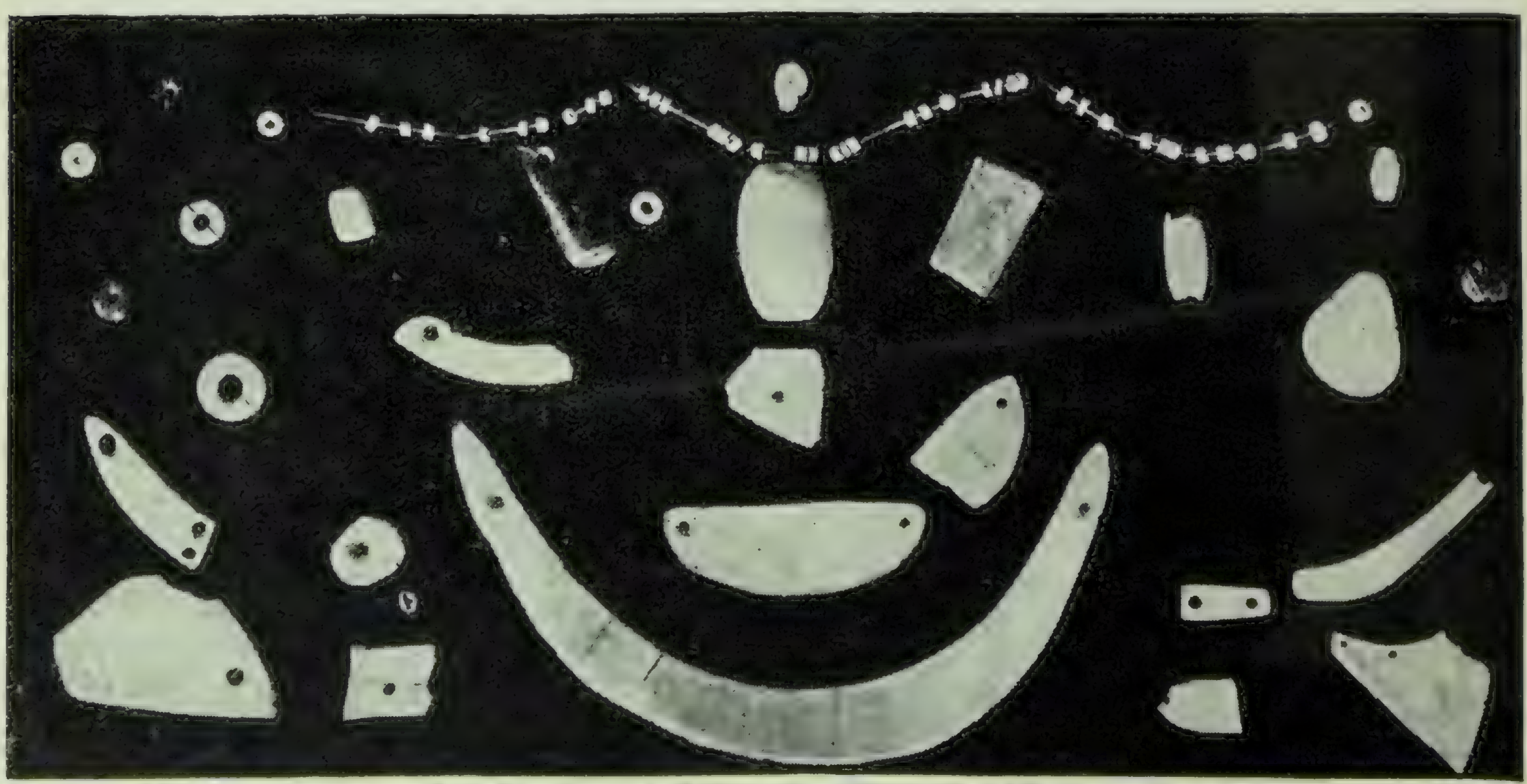
Whole streets were excavated and inside the remains of the dwellings were found circular granaries, or silos, where corn and other dried goods were kept. Some of the dwellings boast of beautiful parquet flooring made of fine stones regularly arranged. One can still detect the hearths of ovens where the bread was baked. There were mills for grinding corn, stone mortars, vases, and pottery articles of every description—everything, in fact, of a lasting nature necessary for the furnishing of a human dwelling. The houses, built for the most part of bricks, fashioned from red clay, are unusually large compared with those found on other ancient sites in Palestine.

The pottery articles were not only abundant and varied, but were well baked, solid, and sometimes elegant. They comprise small plates, dishes, and other vessels, some of them beautifully finished and ornamented. Many stone, flint, and bone implements were found, and some really beautiful and artistic necklaces and bracelets.

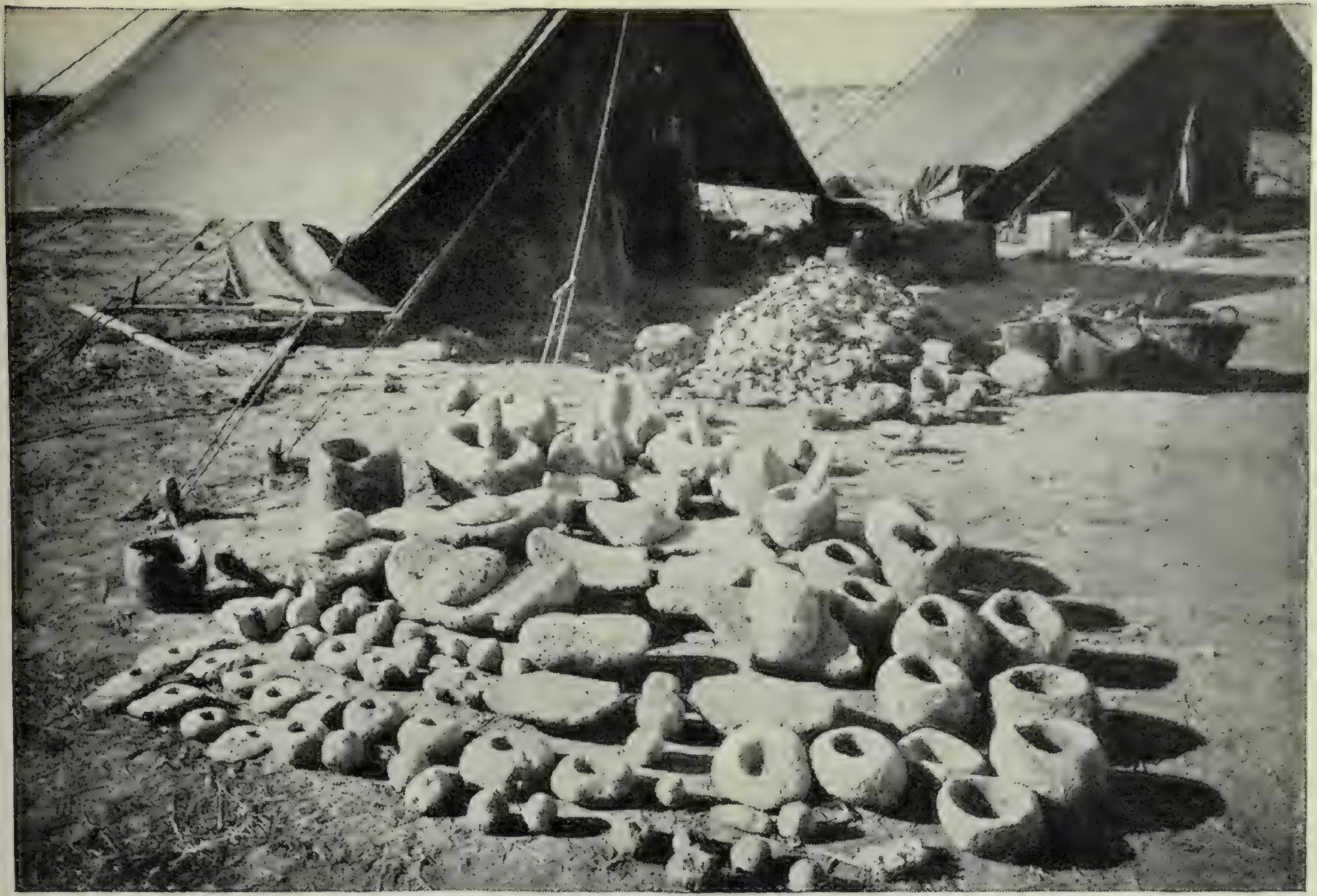
GOD DESTROYED THESE CITIES. NOW THEIR PATHETIC RELICS COME TO LIGHT.

If this were the remains of Sodom, its sister city, Gomorrah, could not be far away. It was found close by, less than half a mile or so away; in fact, Sodom and Gomorrah were virtually twin cities. They must have stood for at least five hundred years, and were probably occupied from before 2500 B.C. down to not later than 2100 B.C. They were destroyed by fire. In the case of both Sodom and Gomorrah ashes were found everywhere. They litter the principal streets to a depth, in some cases, of several inches; ashes covering the courtyards and all open spaces. Stones are cracked and bricks reddened by great heat.

On the other side of the Jordan, some eight or ten miles away, stands all that remains of ancient Jericho. Science would appear not only to have solved the mystery of its tumbling walls, but to have gleaned important facts concerning its history, strength, size and population. Jericho, at the time it was attacked by Joshua's army, was quite a small city, but strongly fortified. It measured but 230 yards in length and 130 yards in width, was about six acres in extent, and contained



These jewellery ornaments were found on the site of the ancient Bible city of Sodom. They include breast and neck pendants made of mother-of-pearl, bone, pearls, and different coloured stones. At the top, tied together by a filament, are forty white pearl beads. The large crescent-shaped pendant in the middle measures about an inch across.



Here are the excavator's tents, and the precious relics found during the patient digging and sifting of the earth. The stone implements seen here include hand-mills, mortars, curious pestles and clubs. They were found on the site of Sodom and Gomorrah. Beautifully ornamented vases, many of them shaped like horns, were also excavated.

probably not more than 1500 people. It was protected by two parallel walls standing some fifteen feet apart. In addition to the walls and their foundations, a gate was also located, a number of towers, a stone rampart and a parapet walk for the use of archers.

HOW DID JOSHUA CAUSE THE WALLS OF JERICHO TO FALL DOWN?

According to the sacred Bible story Jericho was destroyed by fire; and so it was. But its destruction was due to three things—fire, undermining, and earthquake shocks. A careful examination of the ruins proves this. While the trumpeters of Joshua's army were marching round the city their companions were secretly undermining its walls, and placing in holes and crevices trunks of trees, which were set alight when the signal was given for the shouting and blowing of the trumpets. Suddenly, without warning, the walls collapsed, or rather the whole of the western wall and a portion of that on the east. This was due to earthquake shocks, assisted, of course, by the undermining and firing. The region here is subject to earth tremors, and they always pass from east to west, the very direction which would affect the western and eastern walls.

Jerusalem itself has been the scene of much archæological activity during the past few seasons. British archæologists working in the Holy City have unearthed on Mount Ophel, a gentle slope running up from the Pool of Siloam to the present southern walls of the city, the exact site of the City of David, that stronghold which he captured from the Jebusites. They have discovered here rock-hewn chambers which many believe to have been the burial place of the kings of Judah. What is more, a massive gateway was uncovered, as well as a street and houses dating back to the time of Christ, thus enabling the onlooker to visualise the Holy City as Christ knew it.

THE BIBLE STORY LIVES AGAIN AT THE HANDS OF THE EXCAVATOR.

Here was found a street which led from the Temple to the Pool of Siloam. It was lined with houses, many of which are still well preserved, with fine mosaic floors. The remains of a church were found, built probably in the first century to commemorate the march of the blind man who was healed by Christ. There can hardly be any doubt that Christ and His disciples passed through this gateway and along this very street and that it was the

Lonely and still haunted by robbers, the road from Jerusalem to Jericho is as fearsome to the lone traveller to-day as it was in the days of Christ's parable of the Good Samaritan, who found a victim of robbers and gave him help.

scene of the healing of the man who was born blind. Below, on the very ridge of Ophel itself, rock-cut chambers were found, and scholars are divided as to whether these are not the very tombs that archæologists have longed to discover, namely, the tombs of the kings of Judah. These chambers have been used for many purposes since they were hewn out of the rock.

HEBREW PEACE-OFFERINGS—TALENTS OF SILVER AND GOLD.

The collection of Hebrew weights and measures found on the site of the House of Caiaphas reveals the fact that the Jews had evidently different sets of measures before and after the Captivity (606 B.C.). This discovery has been the means of clearing up several historical statements. For instance, written in wedge-shaped writing on a stone in the British Museum there is an account of King Sennacherib's campaigns, during which it states that Hezekiah, King of Judah, gave him, as a peace-offering, 30 talents of gold and 800 talents of silver, etc., whereas the Bible passage reads, "300 talents of silver." This contradiction has been looked upon as a way of boasting on the part of Sennacherib, who said 800 for 300, but now we know that the Assyrian talent was proportionately smaller than the Jewish, which reconciles the two conflicting statements.

Many places which had long been associated with Biblical events have proved to be wrongly located. Take the case of Mamre as an example, the place where Abraham was encamped when he was visited by the three

Jerusalem as seen from the Mount of Olives. In the centre of the picture can be seen the Temple area. High walls surround this space, and within is the Mohammedan Mosque of Omar, also known as the Dome of the Rock. [E.N.A.

Here is the famous Abraham's Oak at Mamre. Under this tree, the trunk of which is 32 feet round, it is supposed that Abraham rested. You will find the incident is mentioned in the last verse of the 13th chapter of Genesis.

heavenly messengers who informed him that his wife, Sarah, though "stricken in years," would bear him a son, and that his seed would become a mighty nation. An ancient oak tree known as Abraham's Oak, in the grounds of a Russian hospice, almost in the centre of Hebron, has long been pointed out as the site. But history records how Constantine, the first Christian emperor, built a Basilica at ancient Mamre, and how the early Christians before him had honoured the site with a church. The remains of these buildings were found, not in Hebron, but some miles away, at a place called Ramet-el-Khaleel.

THE LIBRARY CITY WHICH WAS BURIED UNDER TONS OF DEBRIS.

More important to the historian, perhaps, was the definite location some fifteen miles to the south of Hebron, by Dr. Albright, of the site of Kirjath Sepher, a place mentioned many times in the Old Testament. Kirjath Sepher means "town of books," or "library," and since the discovery in Babylon and in the Hittite country of libraries of clay tablets, hopes have been entertained of similar finds being made in Palestine. Though the excavators have been toiling upon the site for the past four seasons no tablets have so far come to light, but they have by no means given up hopes. The site was buried under tons of rubbish, and so far ten distinct layers, each representing a separate period of occupation, have been uncovered, the latest of which dates back to 2000 B.C.

WEAVING, DYEING AND MAKING CLOTHES ARE AGE-OLD INDUSTRIES, AS THE SPADE REVEALS.

The city was destroyed and rebuilt several times, the latest destruction being that by the Chaldeans, about the years 587 B.C., since when the very whereabouts of the city was lost sight of. Joshua destroyed the city during his terrible raid in the south of Palestine, and the sacred narrative tells us how Caleb, one of his generals, promised his daughter in marriage to the one who was first into the enemy's lines. Evidently weaving formed one of the principal occupations of its inhabitants, judg-

It is thought that this "Well of the Samaritan," at Shechem, is where Jesus sat and talked with the woman of Samaria.

ing by the number of weaver-weights and vessels for dyeing found buried deep in the earth. A curious find was that of a set of dice, a kind of back-gammon game, similar to that played in the East even to the present.

In the Valley of Sorek, associated with Samson and Delilah, the site of ancient Beth-Shemesh, the place to which the Philistines sent back the captured Ark to the Israelites, has been uncovered. It was in the Valley of Sorek, the great highway between Philistia and Jerusalem, that some of Samson's exploits were enacted, and to this day the caves in which he is supposed to have hidden from the Philistines are pointed out. Delilah, his enticer, was also from this region. A part of the old city wall has been laid bare, as well as the remains of an old Canaanitish temple, numerous dwellings, tombs, and many pieces of pottery and jewellery.

SHALL WE LEARN MORE OF THE WICKED KING AHAB AND HIS HEARTLESS QUEEN?

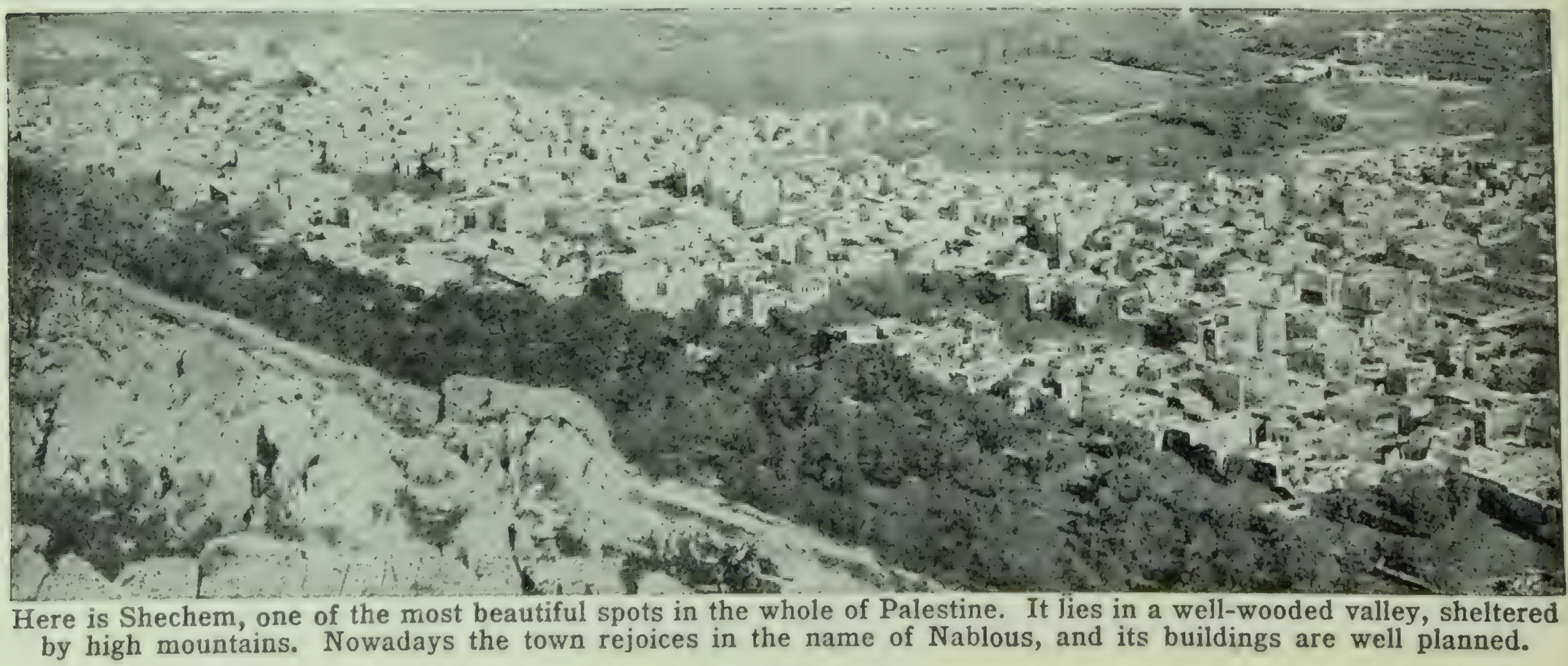
The decision to renew the excavations at Samaria calls attention to the discovery here a few years ago of the palace of King Ahab. Samaria was the ancient capital of the northern kingdom of Israel. Here Ahab, under Jezebel's influence, built a temple to Baal, later destroyed by Jehu; and here it seems he built also his "ivory house," so vividly described in Kings. Nothing remains of this once flourishing and mighty city to-day but a mass of ruins, and, as much hard work has been done here in uncovering both Roman and Israelitish remains, important discoveries are expected to be made.

Thus we realise the importance of these discoveries in throwing light upon the Bible story, and on ancient history.

Then at Shechem, now Nablous, and also at Beisan, in Galilee, the excavator has been at work, and as a result of his labours has thrown valuable light upon the ancient history of the land.

At Tell Hum, the site of Capernaum, at the northern end of the Sea of Galilee, a column has been erected commemorating the late Dr. Orfali's discoveries at this spot. Here he found the extensive ruins of a building probably erected in the time of Our Lord, which is accepted by some scholars as the synagogue built by the centurion of the Gospels and the one in which Christ preached. It was largely composed of white limestone resembling marble. None of the stones of which this building was constructed appears to have been removed, and the synagogue has been partially reconstructed on its original site. Thus, to-day, one can visit ancient Capernaum and stand in the very synagogue in which the Saviour preached.

Then only a few miles away there were unearthed not very long ago the remains of a church, known as the Church of the Multiplication of the Loaves and Fishes, built to commemorate the feeding of the five thousand. We know that such a church existed, as it is mentioned by many pilgrims in the very early centuries. The nun, Etheria Silvia, who visited Palestine in the year 380, gives a description of the church, telling how there was a stone, three feet in width, beneath its altar, the exact spot on which the Saviour stood while distributing the loaves and fishes. The altar was found, and beneath it the stone, so it is possible that this is the much disputed spot where the miracle of the feeding of the five thousand actually took place.



Here is Shechem, one of the most beautiful spots in the whole of Palestine. It lies in a well-wooded valley, sheltered by high mountains. Nowadays the town rejoices in the name of Nablous, and its buildings are well planned.

FOLK STORIES OF THE NATIONS

Throughout history people of all ages have loved to hear a story. Every nation treasures the tales of its heroes, its fairies and its giants. Here are four old folk tales, simply told and handed down from olden times, and from many nations. Later in this volume you will find three more groups, each with four stories from different countries. Folk stories give us a peep into the lives of the people of other lands in other days. These little tales have passed from great, great-grandmother to great-grandmother. At her knees grandmother probably heard them, sitting wide-eyed as the incidents unfolded themselves. So they were handed down to the present day and are here for us to read.

HOW PERSEUS SLEW THE GORGON: A GREEK TALE

PERSEUS was a very handsome boy who lived on an island with his mother, a princess. Now as Perseus grew up to be a young man, he showed himself to be so brave and so daring that the chief of the island was very jealous of him. So jealous did he become that he made up his mind to get rid of Perseus, if he could.

"I will send him on such a dangerous errand that he will never come back alive," thought the wicked chief.

So one day he sent for the young lad and he began to flatter him.

"I have heard how brave you are, and how daring. Now I like brave young men, and so I have made up my mind to trust you with a very difficult task. I have been saving up this task for the bravest and most daring man on my island. To-day I have chosen you, for I think you can carry it out."

Perseus was greatly pleased when he heard the chief say this.

"I will do anything you ask of me, if it is dangerous enough, for I love danger," said Perseus readily.

Slowly the chief spoke thus:

"I want you to find out for me where the three terrible Gorgons live. When you have done that, you must kill Medusa, the chief of them, and bring me back her head!"

Perseus thought soberly for a moment, but his courage was high.

"I will go," he said, and turning on his heel, he left the chief's palace.

Now the three Gorgons were three horrible sisters. They were half-dragons, half-women. Their bodies were covered with silver scales, their tails were made of brass, and instead of hands each one of them had claws. What was worse still, instead of hair upon their heads, they had hundreds and hundreds of creeping, writhing snakes! Medusa was the most fearful of the three. No man could look into her eyes without being turned to stone!

It was no wonder that Perseus was troubled. How could he hope to cut off Medusa's head without looking at her, and how could he look at her without being turned to stone? Besides, where were these three Gorgons to be found? Nobody seemed to know.

It was an almost impossible task, as the chief of the island knew. He thought that he had got rid of Perseus for ever. But wait! As the brave youth walked along the road, thinking about his task, he came face to face with a handsome stranger.

This stranger had tiny wings fixed on to his shoes, and a bright light seemed to shine from his body. He was none other than Mercury, the messenger of the gods.

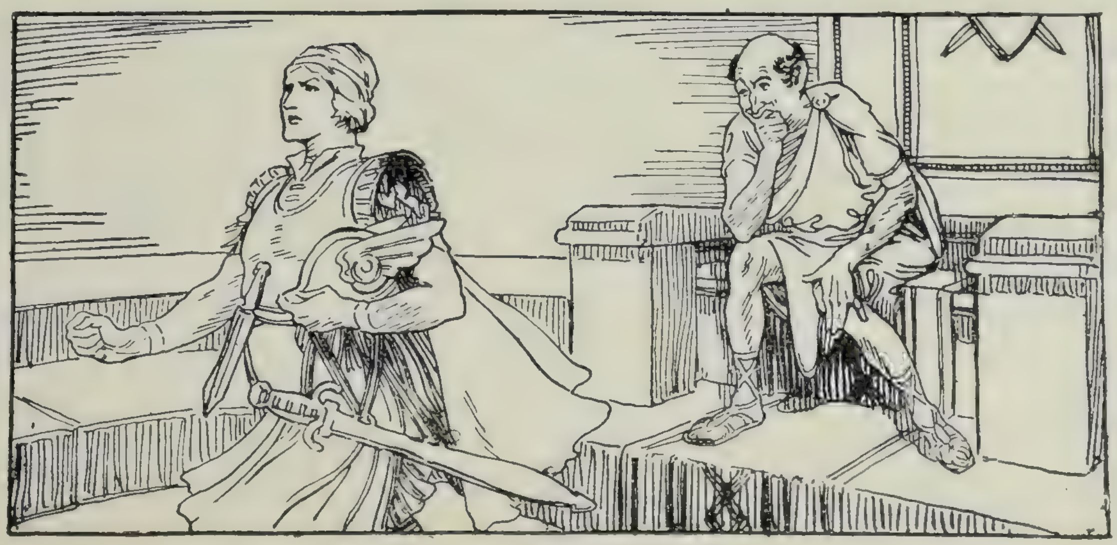
"Why do you look so sad, Perseus?" he asked.

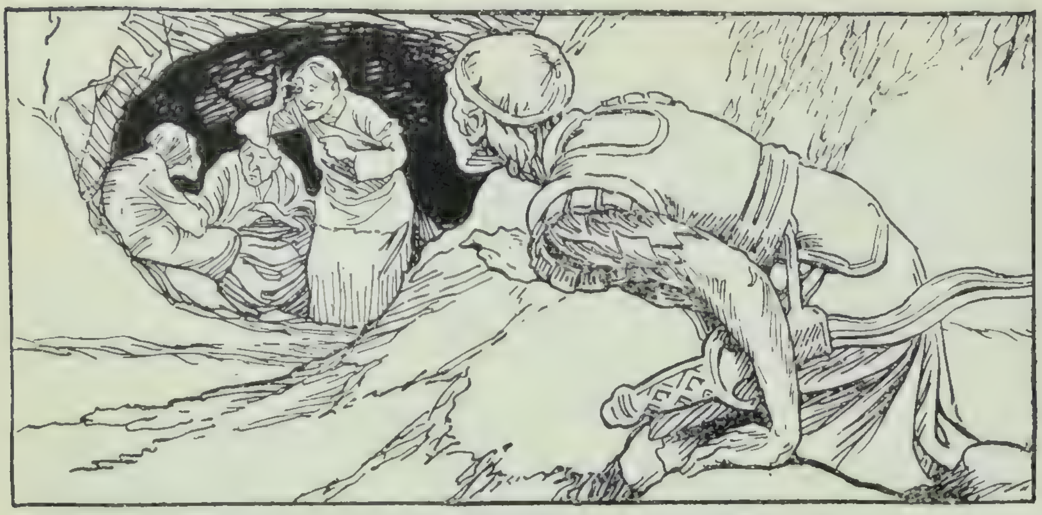
Then Perseus told him of all that he had promised to do for the chief of the island.

"And though I mean to do it or die, I must say I do not even know how to begin," he confessed.

Then said Mercury:

"I will help you. Do as I tell you, and you will succeed. First you must take my winged shoes. They will enable you to fly wherever


"I will go," said Perseus, and he turned and left the chief's palace.



Perseus lay hidden behind a crag near the cave.

you wish. Then you must have my crooked sword. It is a magic sword, and it will serve you well. From my friend, Pluto, I will borrow a magic helmet. When you wear it, you will be invisbile. From my friend, Minerva, I will borrow a golden shield. It shines so brightly that it will act as a mirror and you will be able to see what you are doing without looking directly into Medusa's eyes.

" I will also bring you a goat-skin bag in which to carry the hideous head when you have succeeded in cutting it off. For even in death it will still have the power to turn people into stone."

PERSEUS SEEKS OUT THE THREE GREY SISTERS, WHO HAD ONE EYE BETWEEN THEM.

With these words Mercury was off and away to collect the three gifts from his friends. Now Perseus's hopes were high.

Mercury was back again, in a trice, carrying his gifts.

" Go first to the cave of the three grey sisters," he advised. " They, and they alone, know where the island of the Gorgons is to be found. The rest I will leave to you."

Before Perseus could thank him, the god had disappeared.

Then, smiling to himself at this piece of good fortune, Perseus girded on the crooked sword, put on the winged shoes and carried the helmet and the golden shield in the goat-skin bag.

Then, wink your eyes, blink your eyes, there was our hero flying through the sky, straight to the cave of the three grey sisters.

Down he came to earth just outside the cave. Now the strange thing about these three sisters was that they had only one eye and only one tooth between them. These they used in turns!

Soon the eldest sister came to the mouth of the cave. She was wearing the eye at that moment, and she had come out to see what she could see.

Perseus had hidden himself behind a crag. The old, grey sister began to talk. She told the others of things that were happening in different parts of the world. Her voice droned on and on, and at last her two sisters began to quarrel.

" You have had the eye long enough, sister," cried one.

" No, it is my turn now. Give it to me," said the other.

HOW PERSEUS COMPELLED THE GREY SISTERS TO DIRECT HIM TO THE GORGON ISLE.

They began to fight about it. The oldest sister took out the eye, and tried to pass it on to the second one.

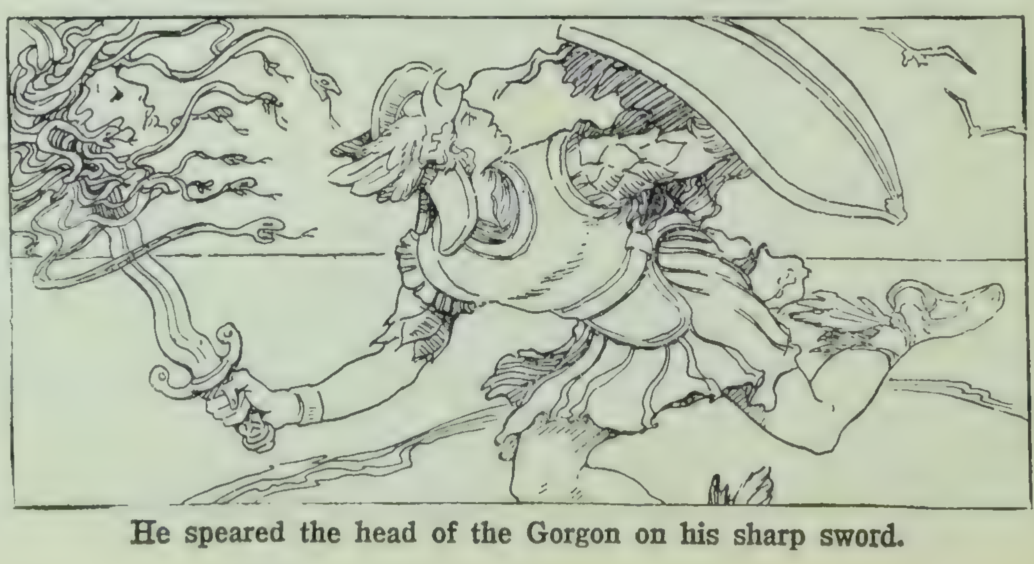
But before she could do so, Perseus whipped out from his hiding-place and snatched the eye away. The sisters began to scream and to scramble for it. But before they could touch it, he was up in the air again.

" Your eye is safe, sisters," he cried. " I have it in my hand, but I will not give it back until you tell me where I may find the home of the three Gorgons ! "

The sisters were unwilling to tell, at first, but Perseus cried :

" If you will not tell me, I will take away your one tooth also."

As this would have been too terrible, the sisters mumbled out where the island of the Gorgons lay. Then Perseus gave them back their eye, and into the air he rose like a bird.



He speared the head of the Gorgon on his sharp sword.

Over lands and over seas he flew until at last he was hovering over the enchanted Island of the Gorgons!

Putting on the helmet, so that he should not be seen, he held up Minerva's bright shield for a mirror. In the shield he could see far, far below him, the three Gorgons sitting in a row. Medusa, the most hideous one, sat in the middle. They seemed as if they were asleep.

Perseus paused aloft to take his aim. Then swooping downwards, still looking into the shield, with one mighty blow from the crooked sword he cut off Medusa's head! It rolled to the ground, the snakes hissing angrily.

Still looking into the shield, he speared the hideous head up on the point of his sword, and then he hid its horrors in his goat-skin bag.

The noise woke the other two Gorgons. They leaped high into the air after their enemy. They tried to seize him in their brazen claws, they lashed out at him with their sweeping tails.

But, wink your eyes, blink your eyes, there was Perseus high up in the clouds again, carrying away the head of Medusa with him.

His joy knew no bounds. He had done what he had set out to do, and there is no joy on earth to equal that.

Over many seas and many lands did he fly, and many adventures did he meet with on the way. But a tale is soon told, and Perseus was at home with his fond mother once more.

He asked her for news, and he was told that the chief of the island had treated the people very badly. He had even been very cruel to Perseus's gentle mother.

Perseus was angry. He saw now why the chief had wanted to be rid of him.

In less time than it takes to tell, Perseus was knocking at the door of the palace.

He was allowed to enter, and there he found the chief, feasting and drinking noisily with some friends. The chief's face turned pale at the sight of Perseus. He had never expected to see him again. Thinking that he had failed to find the Gorgons' home, he said:

"Oho! my fine fellow. So you have failed in your task!"

Perseus looked straight into the chief's eyes.

"I did not fail," he said quietly.

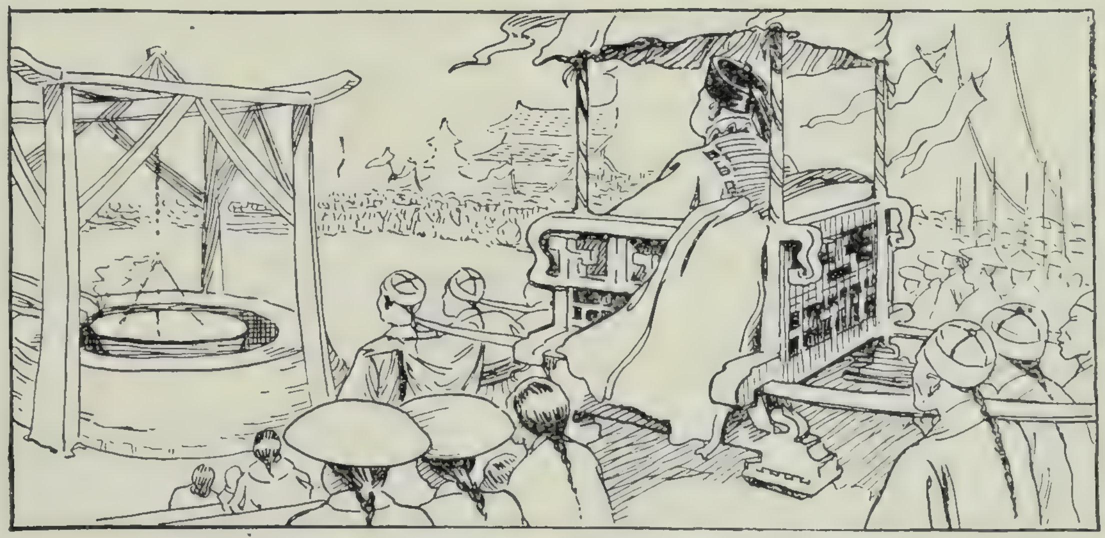
"But—but—you cannot have killed Medusa," stammered the chief.

"Behold the head of Medusa!" shouted the youth, and he drew forth the hideous head, and held it on high.

The chief and all his friends were at that instant turned into stone!

Then the people of that island praised the brave Perseus and hailed him as their hero.

THE GREAT BELL OF PEKIN: A STORY FROM CHINA



The Emperor came to watch the pouring of the metal.

ONCE upon a time there was a great Emperor who ruled over the land of China. He was called Yung-Lo. During his reign the capital was moved from the city of Nanking to the city of Peking. At the same time, many fine buildings sprang up in Peking. One of them was a great Bell Tower.

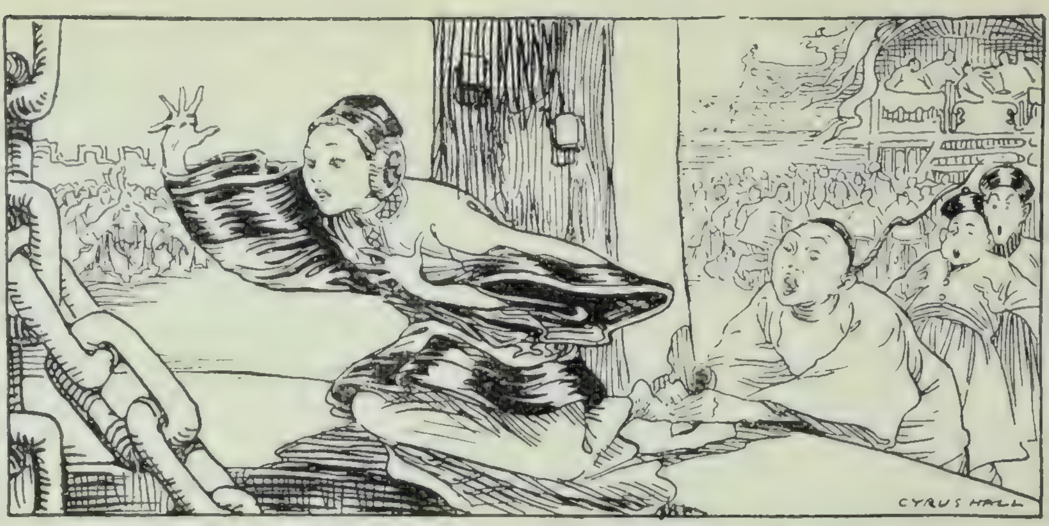
"I must have a big bell made to go inside that tower," said Yung-Lo. "It shall be the finest bell in the country. Its sound must be such that as soon as it strikes, people shall hear it throughout the whole city."

Kuan-Yu, a mandarin, was chosen to make the great bell, for he was known to be a good craftsman. Kuan-Yu was glad that he had been chosen. He lost no time, but set to work at once gathering together the best workmen he could find.

They spent weeks of hard toil in getting the finest materials and in casting the mould. At last the mould was ready and the metals were melted.

The Emperor himself, and all his court, assembled to watch the metal being poured into the huge mould. But alas for Kuan-Yu! The mould cracked and the bell was spoilt!

The Emperor was, of course, very angry



With a cry Ko-ai flung herself into the hissing metal.

indeed that so much time and money had been wasted. But he allowed the poor mandarin to make a second attempt.

Kuan-Yu felt very sad at heart. He had never failed before. Bravely he set to work again, and in a few weeks' time the mould was again ready for the bell to be cast.

A greater crowd than before assembled to watch the work. When the molten metal rushed into the mould for the second time, not a word was spoken.

Breathlessly the people waited to see whether the work was successful. This time the great mould did not crack, but when it was cold enough to be removed, Kuan-Yu found, to his horror, that the sides of the bell were full of small holes. It was just like a honeycomb !

Then the Emperor sent for Kuan-Yu. He came forward trembling in every limb.

“ One more chance will I give you,” said the Emperor. “ This time, if you fail, your head will be cut off. No mercy will be shown you ! ”

WHAT THE MAGICIAN PROPHESIED CONCERNING THE GREAT BELL.

The poor man went home feeling wretched indeed. He read in every book he could find all about casting a bell, and he prayed to the gods to help him.

Sadly he told his only daughter what was to happen to him if again he failed.

Now Ko-ai, his daughter, was very beautiful. Her skin was like the bloom on a peach, her teeth were like gleaming pearls, and her lips were the colour of ripe cherries. But more than this, she was good and dutiful, and she loved her father more than life itself.

So one day she went secretly to the cave of a magician who dwelt among the hills. She told him all about her father's task and asked for his advice. The magician read in his ancient books and thought for a while before he answered. Then he said sadly :

“ The Great Bell can only be made aright when the blood of a good maiden is added to the metals in the mould. So it is written ! ”

This advice upset Ko-ai so much, she went home feeling quite ill.

Her father spent the next few weeks anxiously preparing the third mould.

“ Nothing must go wrong this time, my daughter.”

“ No, honourable father, nothing must go wrong. This time the bell will be perfect.” As she said these words she looked sorrowful.

At last the day for the casting came round. For the third time great crowds assembled. The Emperor and all his court were there.

Just as the stream of molten metal was rushing into the mould, a great shriek arose from the watching crowds.

THE BEAUTIFUL KO-AI PROVES HERSELF THE BRAVEST OF THE BRAVE.

The people drew back terrified. With a cry of “ Father ! ” the brave Ko-ai had flung herself into the boiling, hissing metal ! ”

Her father leapt up and tried to seize her, but he only succeeded in pulling off her little shoe.

He was nearly mad with grief. Some of his kind friends led him away sorrowfully.

After a while the Emperor ordered that the mould should be removed. This was done. The Great Bell was as perfect as it could possibly be !

But the strange thing about it was that when it was hung in the Bell Tower, each time it was struck a low, soft sigh was heard.

“ Hsieh ! Hsieh ! ” This is the Chinese name for “ shoe.”

“ Listen ! ” whispered some one. “ Poor Ko-ai is calling for her shoe ! ”

And from that day to this, when the Great Bell of Peking strikes, one can hear Ko-ai calling for her shoe !

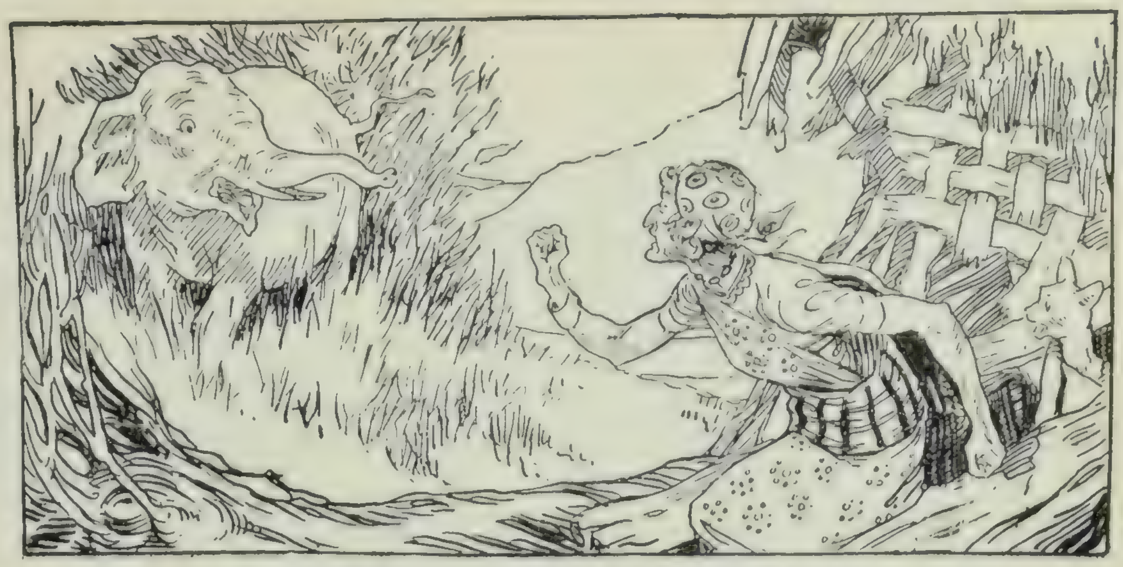
. . . . .

GRAINS OF ADVICE FROM A CHINESE MAN OF WISDOM.

“ It would be hard to meet a man who has studied for three years without learning something good. Learn as though you felt you could never learn enough.”

It is only the wisest and silliest of men who never alter their opinion.

HOW THE TOAD GOT WARTS ON HIS BACK



The old woman rushed out in great anger.

ONCE upon a time there lived an old wood-cutter in the Lushai Hills, in India. He had been chopping wood so long that at last his axe became blunt. "I must find a smooth stone," said he, "and sharpen my axe."

So he went down to the edge of a stream, for there the smoothest stones were to be found. As he sat sharpening his axe, a little prawn popped its head up from the water, and bit the old man's foot.

The old man was so angry that he chopped down a little tree.

"Why do you chop me down?" cried out the tree. "Now I must drop my fruit."

So the tree dropped its fruit, which was about the size of a melon, on to the back of a cockerel. The cockerel, who was scratching for seed, became very angry, and he said to the fruit:

"Why do you choose my back to fall upon? What is the matter with the ground?"

Then the cockerel began to scratch away so angrily that he scratched up an ant's nest. The ants were so cross at being rudely disturbed that they stung a snake, thinking that it was *his* fault. The snake became so angry that it stung a wild pig. The wild pig, roaring with pain, rooted up a plantain tree.

THE BAT WAKES UP AND FRIGHTENS THE ELEPHANT.

Now in this plantain tree a little bat was hanging, upside down, fast asleep. The bat was frightened and flew this way and that way, and at last flew right inside Mr. Elephant's ear!

This made Mr. Elephant so very angry that he rushed about all over the hill-side. In doing so, he knocked down a large tree which rolled and rolled down the hill, until it knocked down an old woman's hut.

THEY ARE ALL VERY ANGRY AND BEGIN TO BLAME EACH OTHER.

Out rushed the old woman. *She* was angry now.

"You must pay for this damage to my hut, Mr. Elephant. Now I have nowhere to live."

But the Elephant said:

"It was all the fault of the bat. He flew into my ear, and it tickled me so much that I hardly knew what I was doing."

Then the old woman went to the bat, but the bat said:

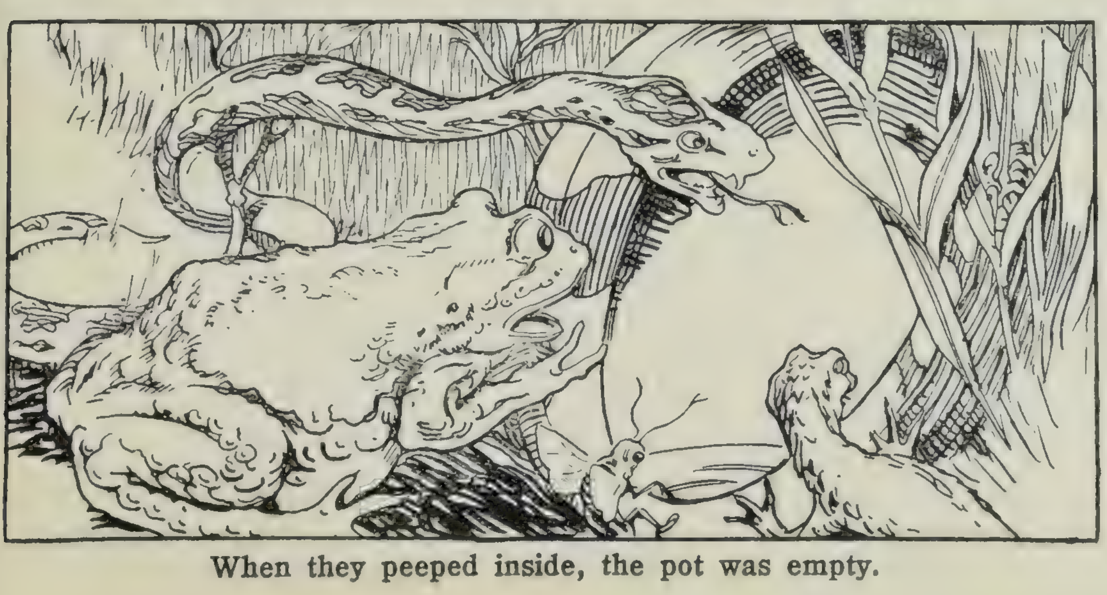
"It was the wild pig's fault. He should not have uprooted my tree."

So the old woman went to the wild pig and put the blame on him. But the wild pig blamed the snake, and the snake blamed the ants. Then the ants blamed the cockerel, and the cockerel blamed the fruit-tree, and the tree blamed the wood-cutter. He, in his turn, put the blame of the whole thing on to the prawn. Now the prawn could blame nobody but himself, so he just hung his head and looked ashamed.

But the other animals were not satisfied.

"You have been very foolish, and you must therefore pay for your folly. You shall be put to death. Now choose which kind of water you shall be drowned in—cold water or hot."

The little prawn chose cold water. So the animals



When they peeped inside, the pot was empty.

took him and pushed him into a pool. But the little prawn did not care. He dived to the bottom of the pool and he stayed there.

Then the animals said :

" See ! He has tricked us. Get him out ! "

But not one of them would put in a paw lest the little prawn should pinch it.

Then the big elephant said :

" I will suck the pool dry."

So he sucked the pool dry. Then the toad picked up the little prawn, and popped him right into his pot of boiling water.

Every little while Mr. Toad lifted up the lid to see if the little prawn was cooked. Each time he did so, he said to the others :

" Too much water," and he drank a little drop to make the water boil more quickly.

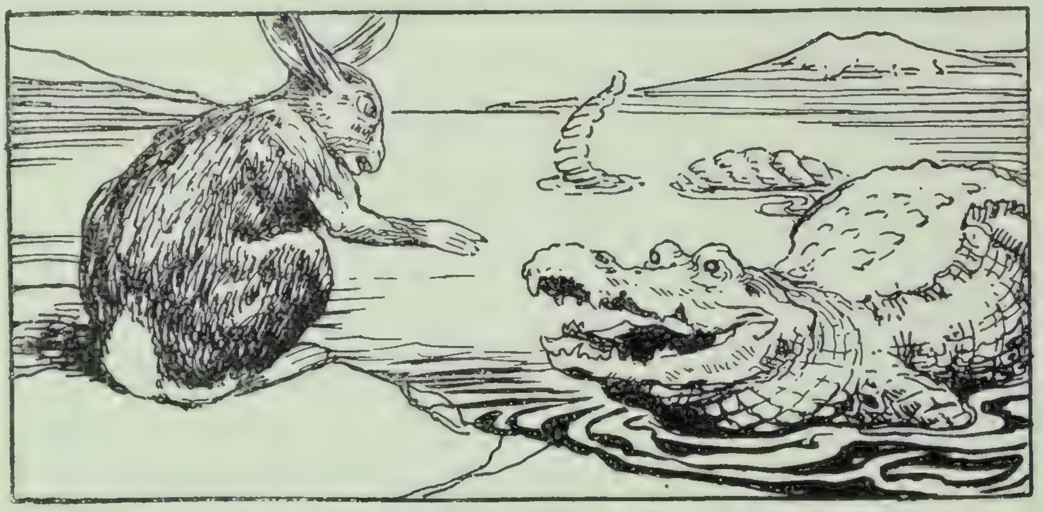
Then, at last, all the other animals grew tired of waiting. They came crowding round the pot, crying, " Is he done yet, Mr. Toad ? Is he done ? "

But when they peeped inside, behold, the pot was empty !

" I must have swallowed the prawn by accident," explained Mr. Toad. " My mouth is so large, you know."

Then all the other animals fell into a fury. They pinched him and pinched him and pinched him. And that is why Mr. Toad, to this day, has warts upon his back !

WHY THE HARE ALWAYS HAS A SPLIT LIP



He saw a great crocodile's head peeping above the water.

Do you know why the hare always has a split lip ? The children of Japan used to think that it came about in this way.

Once upon a time there was a little hare who lived on an island off the coast of Japan. Now this little hare had run about all over the island, and he knew every stick and stone upon it. He longed to go across to the mainland for a change. But, of course, he could not swim.

What was he to do ? He ran about, up and down on the shore, hoping to catch sight of a boat or a sailing ship, but he saw neither. What he *did* see was a great crocodile's head peeping up above the water. This gave the little hare an idea. He knew that if he asked the crocodile to carry him across, he might be in danger of being eaten. So he set about it in a round-about way.

" I say, Mr. Crocodile ! Do you know how many crocodiles there are in this part of the sea ? "

" No, I do not," said the crocodile.

" Well, I have heard it said that there are more hares on this island than there are crocodiles out at sea."

" I'll wager you that there are more crocodiles than hares," said the crocodile.

" And I'll wager you that there are more hares than crocodiles," said the hare. " You go and bring together as many crocodiles as you can find, and we will put them in a row, nose to tail, then I can run along on their backs and count them as I go. See ! "

The crocodile did not wait a moment. Off he went to collect his brothers and sisters. The little hare was delighted. Soon the crocodile came back with about a hundred others.

The little hare pranced up and down on his hind legs. " Now get into a row," said he, "nose to tail, so that I shall be able to count you."

And the crocodiles obediently got into a row, and they stretched just exactly across from that island to the mainland of Japan !

" Hooray ! " said the little hare. " Now I can begin to count."

And he jumped across from one crocodile's back to the other, counting as he jumped. When he came to dry land on the shore of Japan, he turned and laughed.

" Ha ! Ha ! Dear crocodiles ! Kind, kind crocodiles ! It was so nice of you to let me come across on your broad backs. That was all I wanted to do ! "

Then he laughed and he laughed, so much that he split his upper lip, and that is why, to this day, all his descendants have a split upper lip, too !

Lumbering and pulp-making industries have made remarkable progress recently. Here we see short lengths of wood, ready for shipping. After many curious processes, the logs are finally converted into paper,

MIRACLES OF THE TREES

Nature provides for man's needs in myriads of ways. The world is a storehouse where there is enough for all, and when we think of the beginnings of many of the comforts and necessaries we have, we are bound to trace them back to Mother Earth. The grass is responsible for our milk, meat and clothing, for it feeds our cattle and sheep. We shall here talk of three miracles performed on or by the trees of past ages and those of our own time. It must be remembered that these are by no means all the wonderful ways in which trees are useful to man. From trees come rubber, gum, sugar, medicines and even poisons. There is even a tree that gives pure water, and is known as the "Travellers' Tree."

WHEN in the country, among giant, leafy trees, have you ever realised how near you are to something that plays a wonderfully important part in hundreds of everyday miracles ?

But man has done more than be inspired by the beauty of trees. If we go back to the beginning of their romantic story we shall see how those trees have been harnessed to the will of man : how every hour of the day and night they provide us with light and shelter, tools and fuel, luxuries and comfort ; how scores of privileges we now know have originally sprung from the trees.

Imagine this earth millions and millions of years ago. In various parts of the world great forests were forever thriving. As fresh trees took their place the old ones fell back into the water and the mud and there—secure from the air—they underwent certain marvellous chemical changes. Often violent movements of the earth's crust would drown whole forests where they stood and seal them away beneath a coat of sand and heavy sediment. Perhaps a hundred thousand years later that same area would again be raised above water and nourish another vast forest, which in its turn would be sunk and preserved.

The enormous pressure of the earth—along with certain chemical changes—slowly but surely altered the nature of these deep-buried trees. In countless millions of years they were transformed to the black diamonds we call coal.

Between the wood from the trees and the hard black coal, however, there are several stages. The peat, for example—which most of you will have sometimes handled—contains very little carbon—the chief element or ingredient of coal—but it is one important milestone on the road of development. Lignite is another stage nearer. And so on, through Brown and Cannel coals to ordinary household coal and the very hard type called anthracite, which contains as much as ninety per cent of carbon.

Every day men in cages descend deep into the interior of the earth. There, often lying for hours on their back, hacking away at the coal seam above, they defy the peril of lurking gases, crumbling walls and frightful explosions so that we may mend our fires and feed our hungry machines. Often terrible pit disasters occur. Every year the price of coal is paid in scores of lost lives and mutilated limbs.

William Murdock, who helped to make gas lighting possible.

It has been estimated that there are some seven million million tons of coal in existence. But infinitely faster than Nature makes it man is using it up. In 1923, for example, over thirteen hundred million tons were raised. At the present rate of consumption Europe has coal to last for 500 years, but authorities in Britain calculate that our home supply cannot last for more than a century longer. What will happen then?

THE MAN WHO USED HIS INVENTIVE POWERS TO BRIGHTEN OUR WORLD.

One day in 1792 a man named William Murdock heated a quantity of common coal in a kettle, led the resulting gas to a tank and there allowed it to escape through a small hole. He discovered that by applying a match to the escaping gas he had a light by which he could read.

A 1932 gas-works is really little more than a wonderful elaboration of Murdock's original plant. In giant brick ovens—each holding as much as 350 lbs. of fuel—the coal is heated to a high temperature by controlled furnaces, thus liberating the gas and leaving what we call coke behind.

This raw gas, however, contains many impurities which have to be removed before it reaches our homes. In the first place it is passed through water, where a certain amount of tar and ammonia (which is later used in many ways) is removed, after which it is condensed and again scrubbed and washed to eliminate other traces of ammonia and tar. Whereupon a treatment by lime gets rid of sulphur impurities and the gas is ready for storing in those easily-distinguishable tanks we often call gasometers.

Do not imagine that the products left over in the manufacture of gas are wasted. Just the reverse! Take, for example, coal tar. Upon examination it seems a very undesirable gummy black substance. Yet the ingenious modern chemist performs with it some really amazing miracles. Would you like a disinfectant or a perfume? a brilliant dye or a grease-spot remover? a sweet or a violent explosive that could blow you to atoms? Well, these are only some of the things that find their origin in coal tar.

COAL, WHICH PROVIDES US WITH MANY USEFUL SUBSTANCES.

It is first heated in cylindrical iron holders. The first substances—or "fraction" as it is correctly called—to be discharged are the light oils, benzol and toluol. The former is extensively employed in the manufacture of motor spirit and the preparation of aniline, which offers a wide choice of dye colours to the enterprising modern chemist.

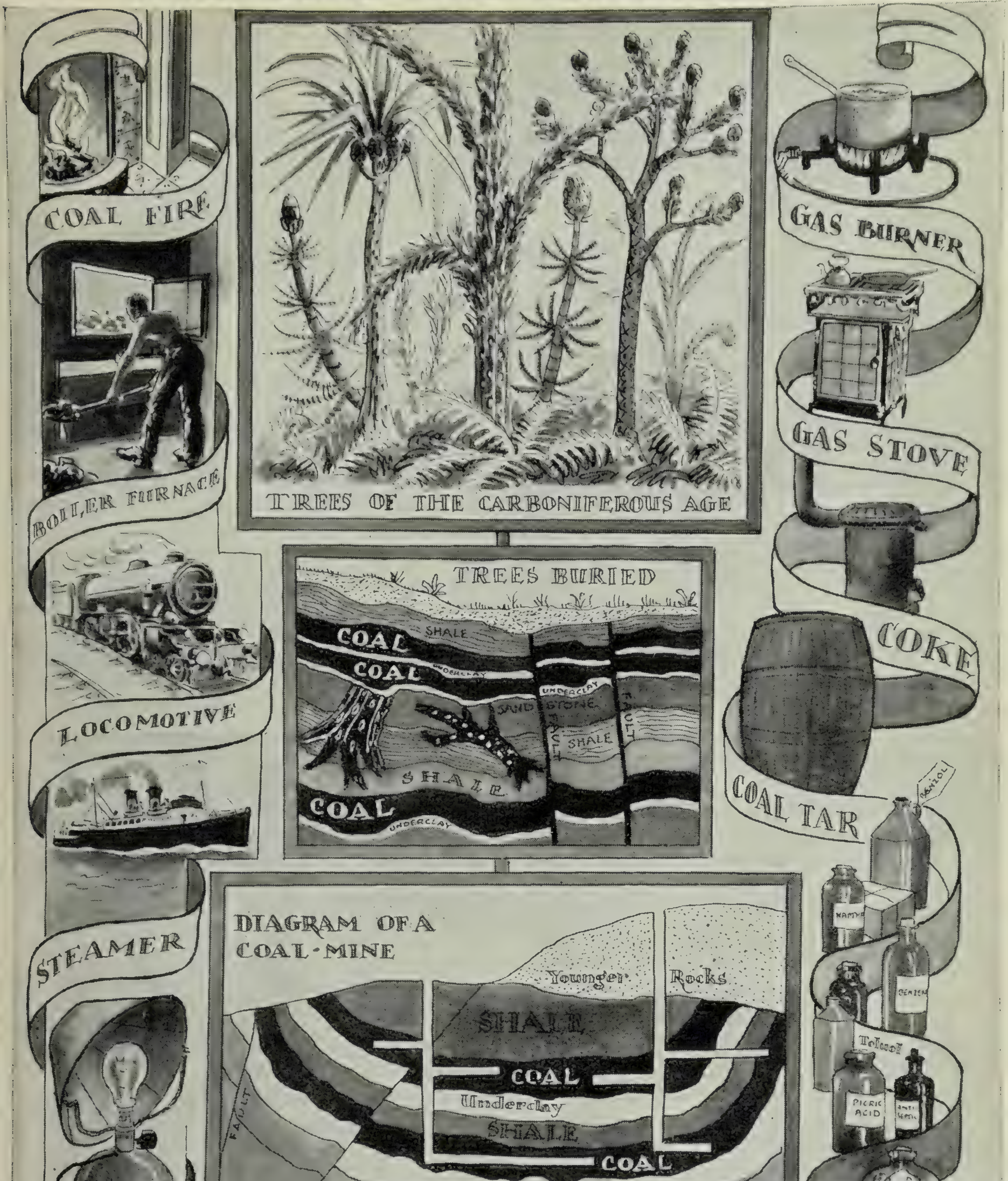
From toluol we obtain benzoic acid—often used as a preservative; picric acid—the basis of more dyes and an exceptionally high explosive; saccaharine—which is 300 times sweeter than sugar and was widely used in wartime when ordinary sugar supplies were cut down.

At a later stage carbolic oils are discharged which can be used in the preparation of various disinfectants and perfumes. The ordinary household moth balls are largely manufactured from the naphthalene in coal tar, and lampblack, used for black lead, has the same origin.

Even the black pitch left behind is put to good use for waterproofing and road-paving purposes!

Miners have to work under many difficulties before they can provide us with coal. Above we can see the cramped conditions of work in the mine. It is so warm deep below ground that miners often work stripped to the waist.

OLD KING COAL—THE UNIVERSAL PROVIDER


COAL FIRE
BOILER FURNACE
LOCOMOTIVE
STEAMER
ELECTRIC LIGHT
GAS
TREES OF THE CARBONIFEROUS AGE
TREES BURIED
COAL
SHALE
COAL
UNDERCLAY
UNDERCLAY
SANDSTONE
FAULT
SHALE
FAULT
SHALE
COAL
UNDERCLAY
DIAGRAM OF A COAL-MINE
Younger Rocks
SHALE
COAL
Underclay
SHALE
COAL
FAULT
FAULT
Underclay
Older Rocks
SHALE
GAS BURNER
GAS STOVE
COKE
COAL TAR
BENZOL
NAPTH
BENZENE
Toluol
PICRIC ACID
ANTISEPTIC
CARBOLIC ACID
Pitch
PERFUMES
CREOSOTE
ANILINE DYES
SACCHARIN
BY-Products

FROM FOREST TO PRINTING PRESS

SHALL we examine together another way in which resourcefulness and brains have disciplined the forests for human benefit? This time it is not the tree of long ago—crushed and changed into coal by the weight of the earth and the relentlessness of chemistry—but the living trees of to-day.

Waiting to be converted into paper. In the picture above we see a view of the yard packed with stocks of wood pulp ready for shipping. Huge cranes are busy at work.

It is impossible to imagine what would happen in this busy world were we suddenly to lose our supply of paper. If the pen is mightier than the sword then paper is stronger and more powerful than steel. Without it modern knowledge would be unthinkably confined and limited in its influence. Daily newspapers and inexpensive books would be out of the question. There would be no such thing as attractive wall paper to brighten our homes; no convenient wrapping for our parcels; no sensitized surface on which to print our photographs and no material on which we could easily preserve our thoughts.

HOW THE GIANTS OF THE WOODS ARE LAID LOW FOR OUR USE.

Paper is made from trees. But how? Often at the cinema you will have seen dramas of life in the great Canadian lumber camps where bronzed men hew down giant trees and steer them down-river to the waiting paper mills. Shall we follow them there? The lumberman's first task is to strip the trees of their bark, remove the knots and all vestiges of decay. A powerful cutting machine then saws the trunks into convenient four-foot lengths.

Now there are two chief methods of paper-making, best summarised as chemical and mechanical. In the former process the logs are chipped and allowed to cook for hours in a special chemical solution. In the latter process—which is the more interesting—they are mechanically ground. Held tight in strong steel pockets, the logs are pressed against a large-surfaced revolving grindstone. Water playing on the stone washes away the minute chippings or fibres, thus preparing a pulpy substance. This pulp is then carefully strained through a fine vibrating screen in order to remove any solid particles, and in many cases it is bleached at the same time.

HOW WOOD-PULP UNDERGOES A MAGIC PROCESS BEFORE IT BECOMES PAPER.

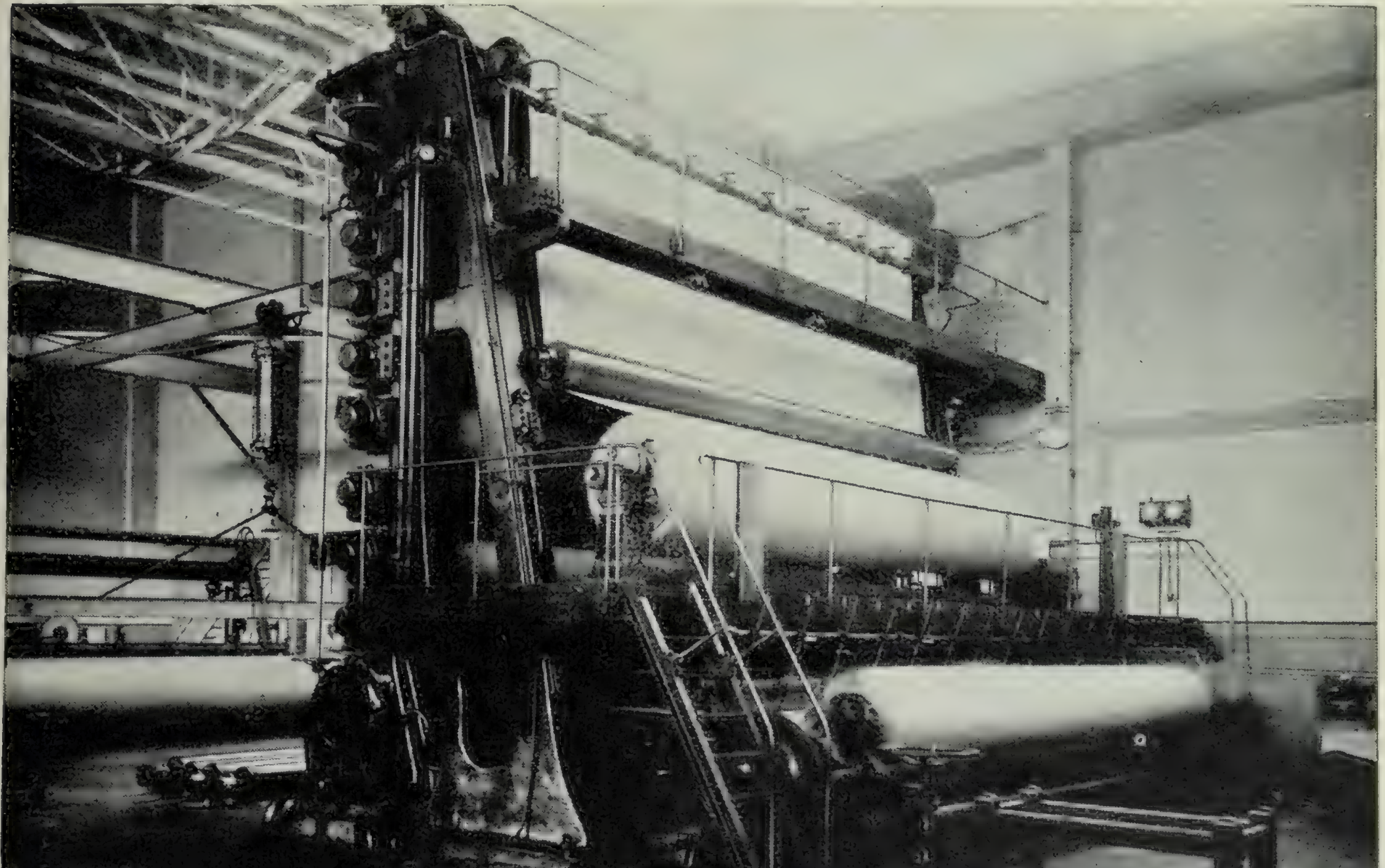
Now comes a very severe thrashing for the prepared wood pulp. It is poured into large oval tubs—known as " beaters "—in which are fitted revolving horizontal rollers with a generous quantity of knives fastened into them. At this point a " Filler "—usually china clay or sulphate of lime—is introduced to fill up the pores in the stock and make the material heavier. Resin sizing, too, is usually added to form a varnish and prevent the finished paper from being absorbent.

Again the stock passes through a refining machine, where it is once more mixed and beaten with revolving knives. The liquid now flows on to an apron of waterproof cloth, whence it is evenly spread on a belt of fine wire cloth which travels over small rollers through which the water gradually drains away. A clever device gives the fine wire cloth and its load of liquid paper a sharp sideways shake,

A view of the boiler-house, showing the water tube boilers fitted with mechanical stokers, as the quantity of coal used is too large to be fired by hand successfully.

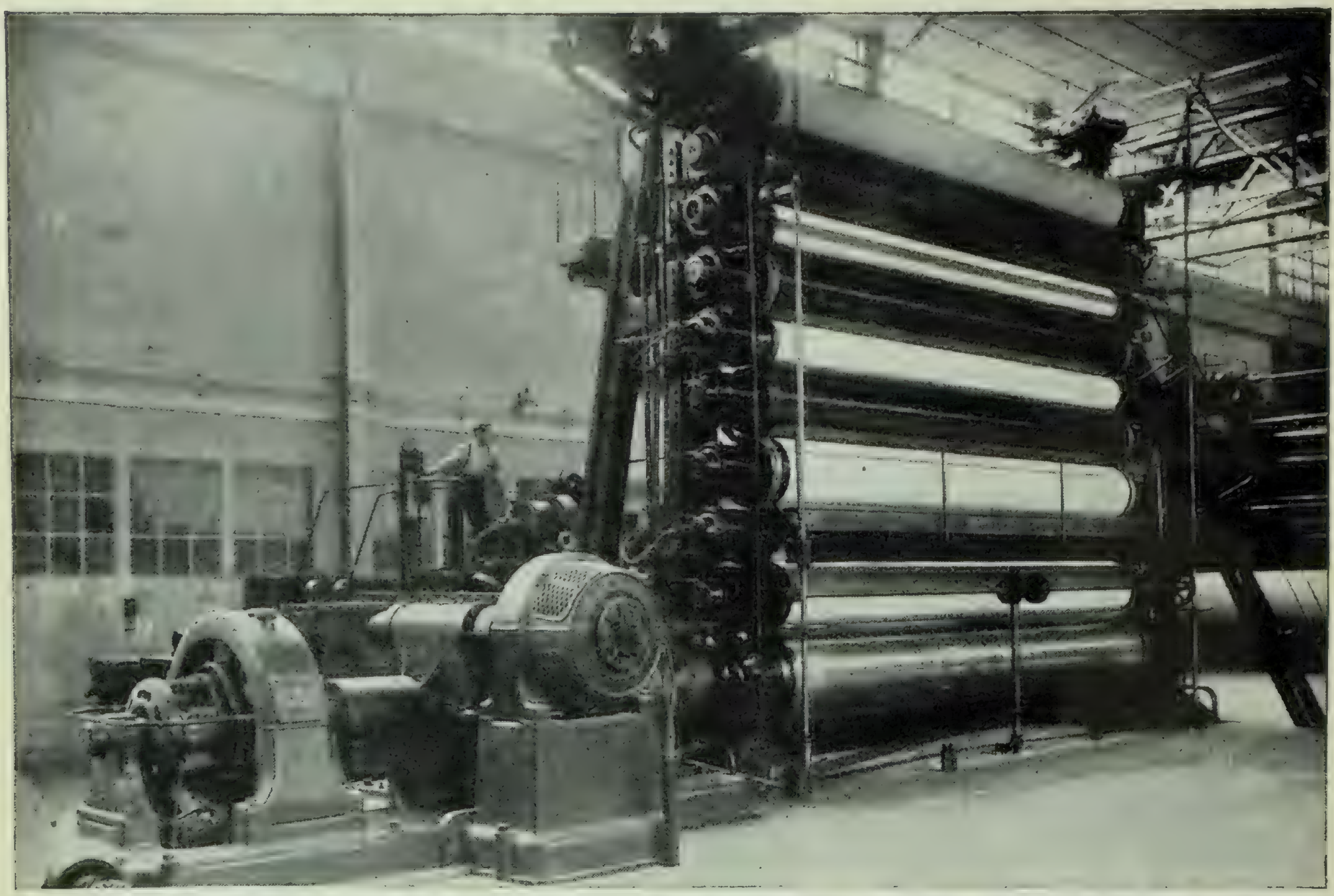
LET'S PEEP INSIDE A PAPER MILL

Here we see the Beater Room where the raw pulp goes through various processes. First it is beaten and then dropped into large chests on the floor below. Note the large beaters and heavy rollers used for this interesting process.

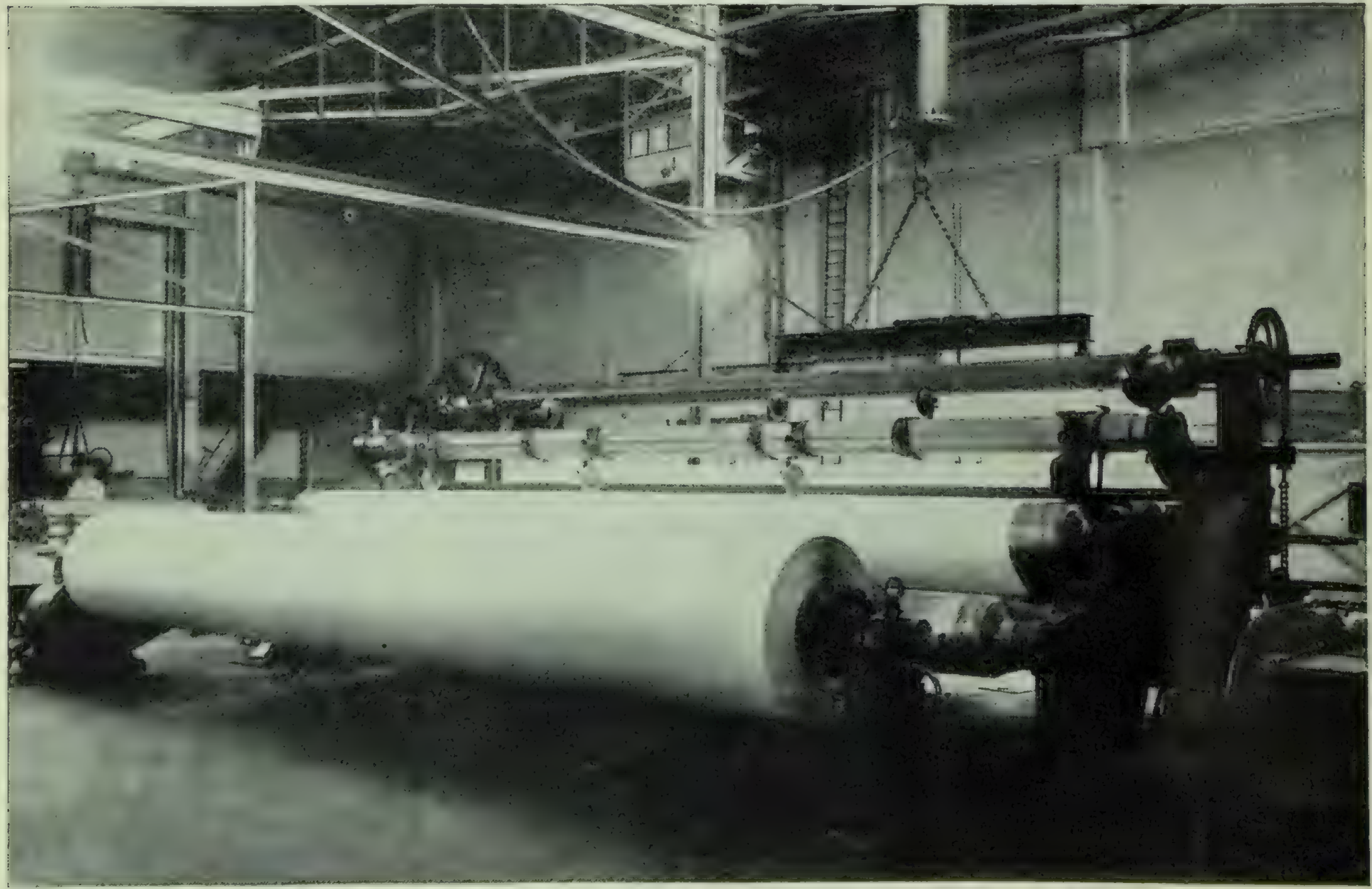


The paper, after leaving the paper-machine, reaches another called the "Super-Calender," where it is glazed by passing between the giant rolls. The speed can be varied up to a maximum of 2000 feet of paper per minute.

[Photographs by courtesy of Messrs. W. V. Bowater & Sons, Ltd.



The "Super-Calender" is here shown from behind. This giant machine consists of a stack of ten gigantic rolls mounted one above another, and driven by an electric motor. We can see the driving gear in the picture.



After leaving the Super-Calender, the paper is taken to the slitting and reeling machine, which we see above. Here, by means of revolving knives, the paper is cut into different lengths. The rolls are then lifted out by means of an air hoist.

[Photographs by courtesy of Messrs. W. V. Bowater & Sons, Ltd.

thus locking the fibres crosswise as well as lengthwise.

By this time the material that was once wood pulp has become a thin but moist and delicate web. After once again being carefully pressed between rollers it is passed over and under steam-heated cylinders which dry it.

THE PRINTING-PRESS GETS BUSY, SHOWING THE MARVEL OF MODERN MACHINERY.

Before the paper is properly smoothed and machined, however, it has to pass through the calenders, whose function is to give a polish and quality-finish to the material. After the calendering process it only remains for the finished paper to be wound on reels, carefully trimmed and cut into rolls of standard dimensions.

Sounds very simple, doesn't it? Actually, of course, the practical manufacture of paper is a highly-skilled trade, demanding a wide technical knowledge and the wisdom of experience.

For there are so many different kinds of paper, varying from the most delicate to the strongest card. Could you but peep inside a large paper mill you would be astonished at all the variety of styles.

Imagine yourself in the machine-room of a great daily newspaper sometime near midnight—just at the moment of going to press.

Busy men in overalls are adjusting a giant reel of paper on its heavy spindle. Others are rapidly attending to the inking rollers and securing the last plate on the cylinders.

A sign from the foreman. The touch of a switch. The faint whirr of machinery which in a moment swells into a deafening roar.

Hurrah! The first edition is on its way!

At baffling speed the reel of paper unwinds, passes over the inked plates, is cut, folded and discharged at the other end of the press.

The paper, after going through so many processes, is now nearing the end of its strenuous journey. This photograph shows the reels packed and ready to be sent to newspaper offices where they are finally printed.

Next morning it is waiting on the table when your father comes down to breakfast. As he turns over the sheets does he ever remind himself that once it was a handsome tree growing in a magnificent forest?

NATURE HAS TAUGHT US HOW TO MAKE USE OF THE TREES.

Hundreds of years before Man ever dreamed of paper as we know it to-day, the little Hornet was using its sharp beak to chip off particles of wood from the trees, chewing them into a pulp and then spreading out the pulp to dry into a crude form of paper.

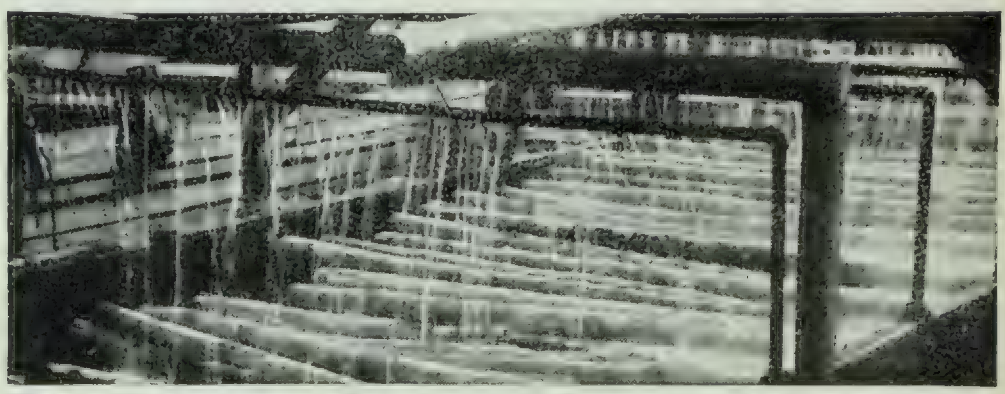
The modern pulp mills really do the work of the Hornet's beak on a very large scale. Wooden logs are ground by powerful machines and mechanically mixed with water. Various chemical processes are used to convert the pulp into the required consistency or thickness.

Above we see the largest newsprint machines in Europe. Those gigantic workers which can run at a speed of 1250 feet per minute, are over 100 yards long and make a reel of paper exceeding twenty feet wide and weighing five tons.

HOW DOES A TREE BECOME A LADY'S FROCK?

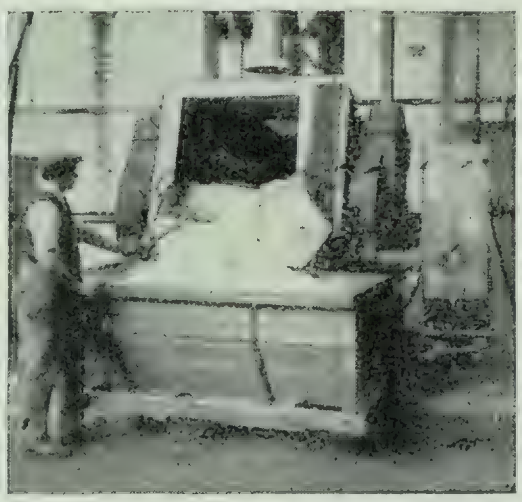
Giant Canadian timbers in the forest.

A shoal of logs floating down Ottawa River to be made into pulp and paper.



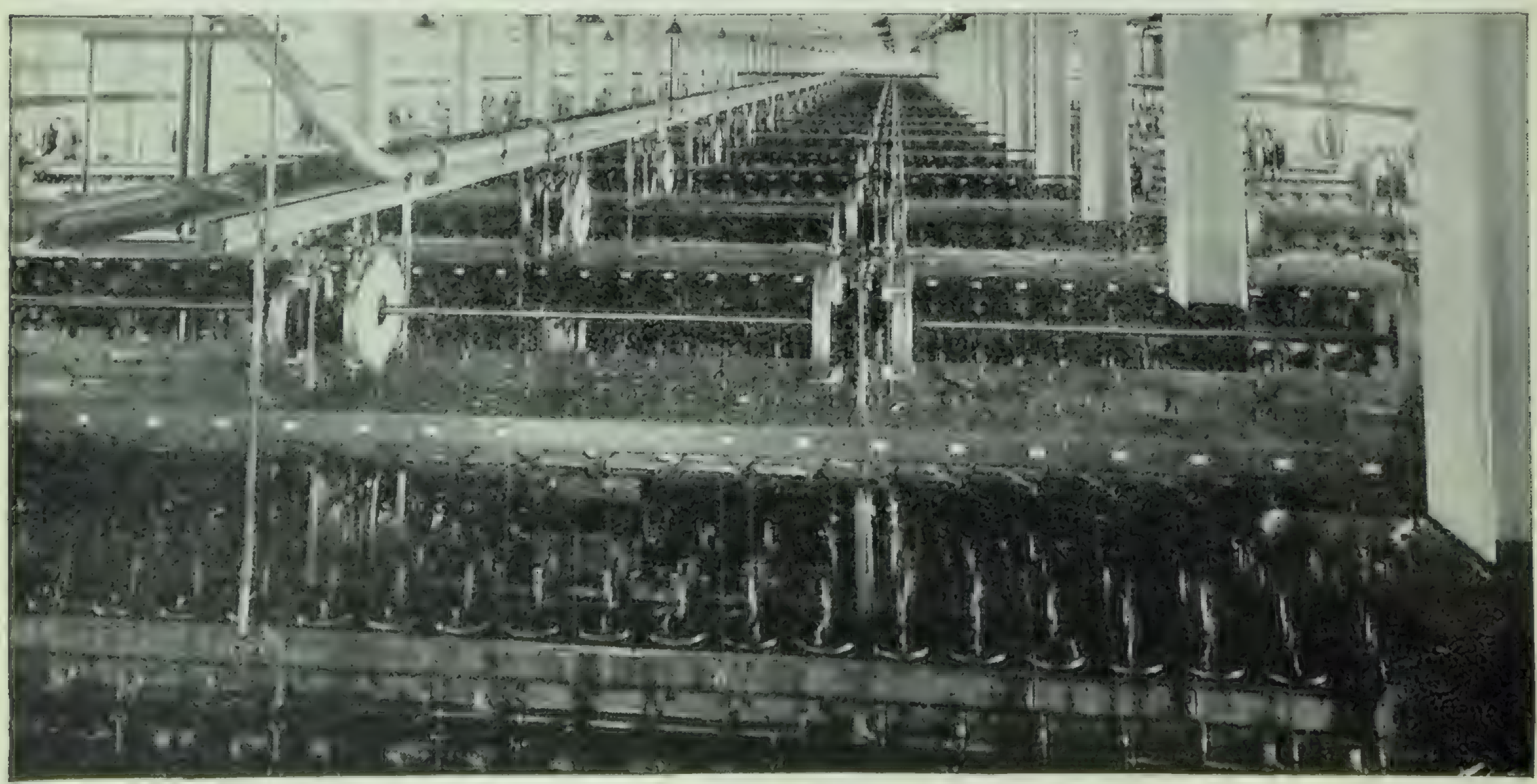
The bark being removed from the logs in the process of pulp manufacture.

Sample bundles of pulp being tested.



Powerful shedders tearing the sheets.

Mixers dissolving cellulose xanthate.



This machinery shows us details of silk spinning. In modern machines each spindle is driven by its own electric motor.

The illustrations on this page and the three following pages are by courtesy of Messrs. Courtaulds, Ltd.

ALREADY we have seen one marvellous use to which pulverised trees can be put. There are hosts of others.

But first we must learn something of a substance which in many ways is even more versatile than coal tar. It is called Cellulose.

Trees, like human beings, have to breathe, but, unlike us, they do not breathe oxygen. Instead they draw upon the carbon dioxide in the atmosphere and for this purpose they contain a wonderful chemical substance named chlorophyll. This compound can very easily be broken up and changed into something else. You know very well, for example, that grass—when cut—loses its green colour and turns into hay. The unstable chlorophyll has been disturbed by cutting, and changed into other chemical substances, some of which are yellow in hue.

Magical cellulose is one of these substances. Chemists call it a carbo-hydrate and give it the formula CHO. The action of the sun on the green leaf first makes starch, then turns the starch into sugar and finally changes the sugar into cellulose.

This sticky liquid, not unlike treacle in appearance, is the viscose solution. We see it being tested in a beaker.

Though Man has never yet succeeded in creating a single particle of this versatile substance which forms the cell walls of plants and accounts for more than one third of all vegetable matter, there seems no limit to the variety of uses to which the industrial chemist can put it.

CELLULOSE—THE MAGICAL SUBSTANCE WHICH HAS MANY USEFUL PRODUCTS.

Cotton for our clothes, hemp and sisal for our ropes, celluloid for our films—all are originally prepared from cellulose. And if ever you cut your finger and have it dabbed with collodion—which dries immediately and forms an artificial skin, thus stopping the bleeding—you should remember that this useful first-aid preparation was once growing on a tree.

By far the most interesting product of cellulose is artificial silk—more accurately known as Rayon. For more than a hundred years Man taxed his ingenuity to find some substitute for silk which would equal the real article in appearance and yet be much less expensive. Has success been achieved? The most convincing answer to that is in figures rather than words. In 1892 the world produced 31,000 pounds of rayon; ten years later it produced 5,000,000 pounds; in 1931 the total output was 470,000,000.

OUT OF A JOB! SILK-WORMS WHICH ARE UNEMPLOYED.

One can obtain a closer idea of what rayon has done for industry when one remembers that to produce one pound of natural silk over 16,000 silk worms are required. So, you see, the trees are putting the silk worms out of employment! It is a most fascinating study to learn about the wonders of the wood.

The principal processes of rayon manufacture vary greatly in their chemical reactions and in the machinery employed, but they are all alike in the principle of producing a solution of cellulose, pumping it through fine holes or jets and, as it emerges, coagulating (that means setting and giving coherence to) the cellulose threads into continuous solid filaments or fibres.

Shall we briefly trace the story of rayon from its origin in the fine Canadian forests to the lovely hosiery, underwear, pyjamas and hosts of other beautiful rayon-made articles in the shops?

Picture a wide river, packed with over a million 30 ft. spruce logs, slowly floating down to the pulp mills. There they are stacked to season before the bark is removed, the logs cut up into small chips which are placed in digesters and cooked by steam in the presence of an acid bisulphite fluid. Thus practically all the ingredients of the wood except the cellulose are removed. After bleaching, the cooked material is washed and small solid impurities extracted in "rifflers." For preparation into convenient shape, the pulp is screened to remove the mass of water and then run over large steam-heated cylinders, appearing at the other end like huge sheets of thick blotting paper.

At the rayon mill the cut sheets of pulp are thoroughly steeped in a mercerising bath of

In this picture we see the rayon, which is nearing the end of the process, being carefully wound into hanks.

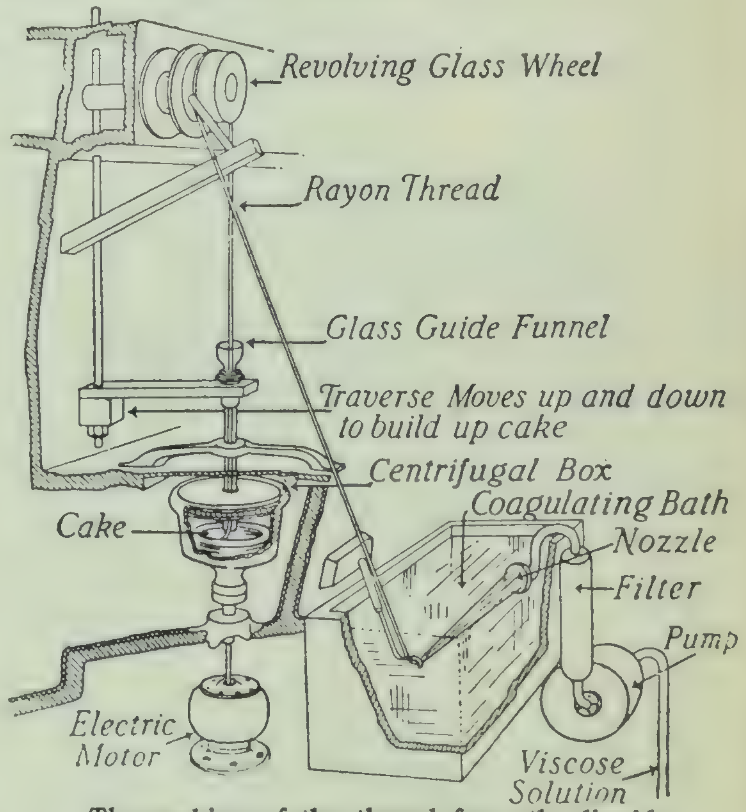
caustic soda. This done, they are taken to shredders, where revolving spiral knives break them into little crumbs. These crumbs are then treated with carbon bisulphide which turns them into a brownish and almost solid gelatinous mass, which is later again dissolved in a weak solution of caustic soda. Chemists speak of this process as xanthation, though the actual product at this stage is known as Viscose, the term chosen by its inventors, Cross, Beadle and Bevan. After thorough filtration the viscose is placed in large containers where it is allowed to ripen.

It is from this clear, sticky, treacle-like liquid that the lovely rayon threads are produced. Though the actual practical methods of spinning are exceptionally intricate, there is no reason why we should not understand the elementary principles.

Cakes of rayon, after being wound into separate hanks, are washed, bleached and dried, after which they are carefully examined and graded by inspectors.

The viscose solution is pumped up to the spinning machine and delivered to a nozzle, usually of a platinum-gold alloy, which closely resembles a large thimble, the flat top of which is pierced with a number of minute holes. The spinning solution is forced under pressure through the nozzle holes and the liquid turns into slender threads in an acid bath. These are drawn together and passed on to apparatus which builds them up into a cake of rayon thread. After winding into hanks, they are carefully washed, bleached, dried and tested, ready for despatching to the manufacturers.

Hundreds of clever refinements had to be introduced before the tempting fabrics in the shops to-day were possible.



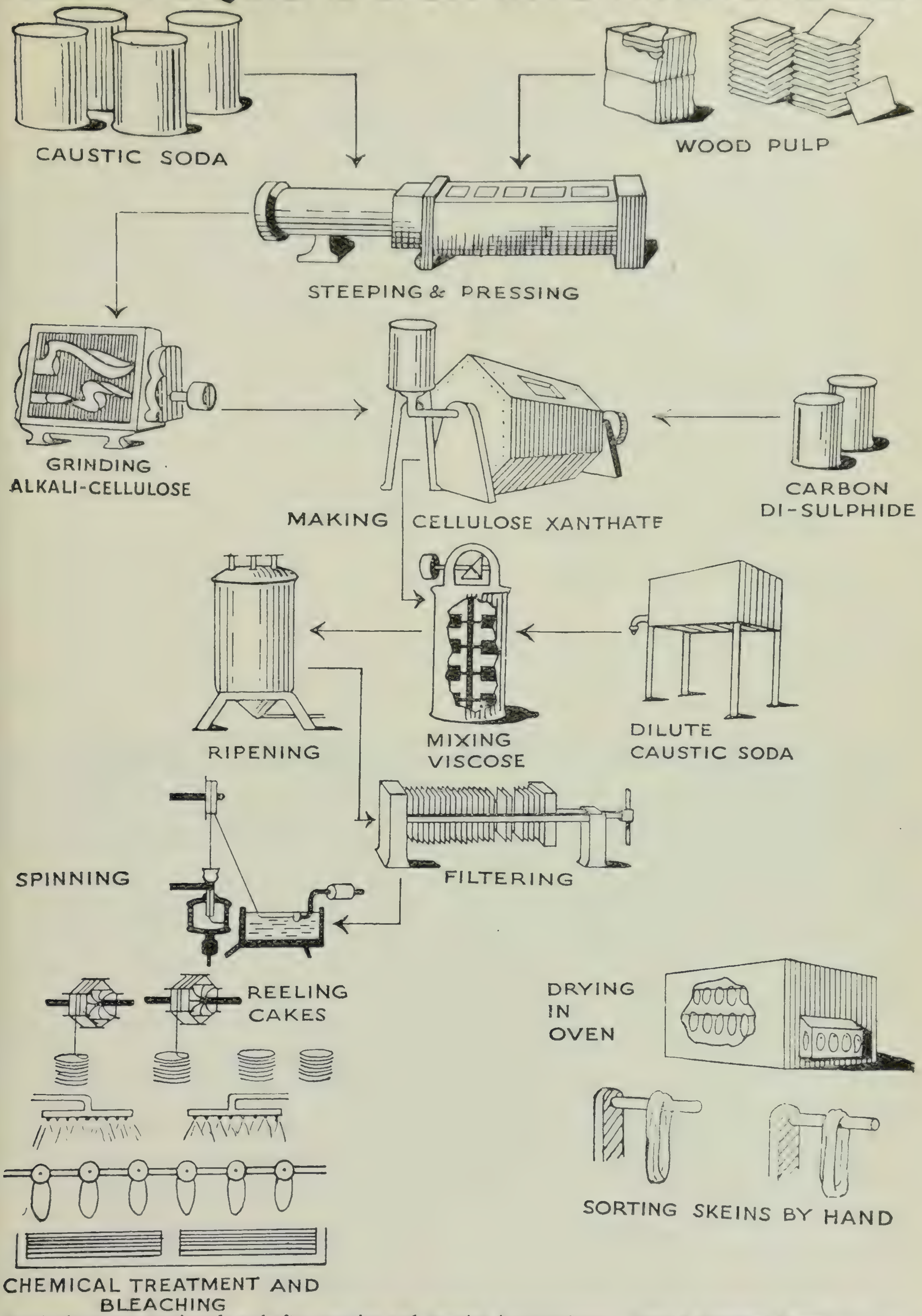
The making of the thread from the liquid.

Yet the rayon industry is not the only one that springs from cellulose. Ordinary celluloid, for example, is only a treated form of cellulose, while gun-cotton—a powerful explosive—is little more than the same substance treated with nitric and sulphuric acids.

Another interesting fact about cellulose is that it forms a protecting tunic for a strange fish named the sea-squirt. Occasionally, however, the more wily crabs strip off the sea-squirt's tunic and use it themselves as a disguise. Unknown to them, it is composed of pure vegetable cellulose.

And so the miracles of the trees unfold themselves. Year by year Man's persistent brain probes into their secrets and disciplines them for the benefit of us all.

HOW A LIQUID IS SPUN INTO ARTIFICIAL SILK


CAUSTIC SODA
WOOD PULP
STEEPING & PRESSING
GRINDING ALKALI-CELLULOSE
MAKING CELLULOSE XANTHATE
CARBON DI-SULPHIDE
RIPENING
MIXING VISCOSE
DILUTE CAUSTIC SODA
SPINNING
FILTERING
REELING CAKES
DRYING IN OVEN
SORTING SKEINS BY HAND
CHEMICAL TREATMENT AND BLEACHING

Woodpulp meets caustic soda and after steeping and pressing is ground up. Then a chemical known as carbon disulphide acts upon the mixture and more caustic soda is added. After ripening the mixture is filtered and the treacly liquid squirted into acid, when it becomes a continuous thread. The thread is wound into cakes. These are reeled, treated and dried. Thus is the miracle performed, and liquid is transformed into rayon. [*Courtaulds*

HOW TO MAKE TABLE GAMES

Again we turn to something you may do for yourselves The apparatus needed for the making of the two games that follow is simple. Paper, ink, and possibly crayons or water colours are all the materials you need, and with these you may design games to give much enjoyment to yourselves and your friends. Here you will read how to make dice and counter games and a novel card game.

THE photograph on this page shows an exciting table game played with a dice and a number of tiny motor cars, which proved very successful in thrilling the children for whom it was made. It was drawn out on a large sheet of thick cartridge paper (about 17 in. by 20 in.).

HOW THE "JOURNEY" GAME CAME TO BE MADE.

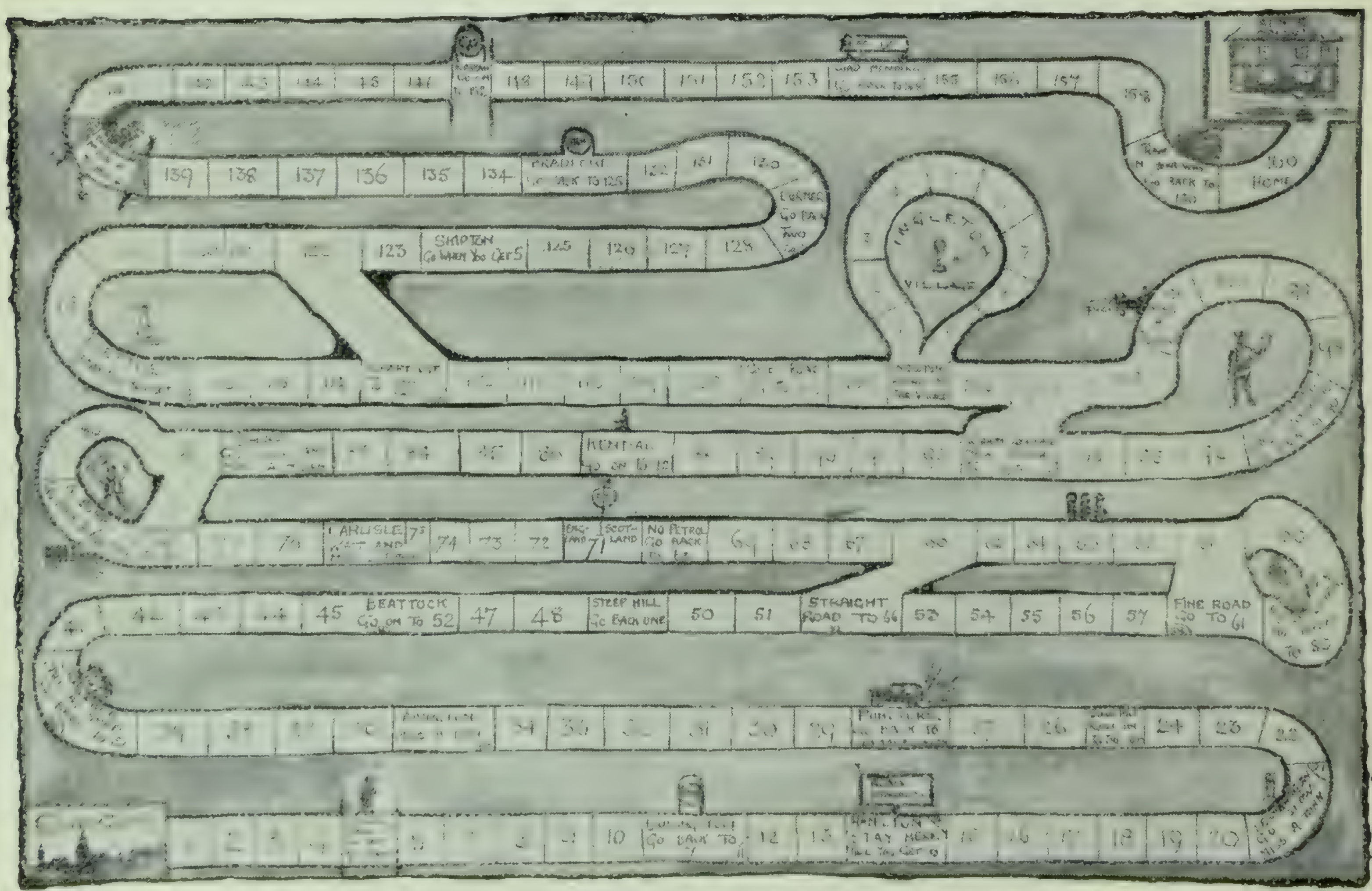
When the old-fashioned table games have become rather stale, clever boys and girls should be able to make up games for themselves. The game in the photograph shown here was made as a result of children being taken about 250 miles away from their native town in England to live in Scotland. Naturally, one of the keenest joys of these children was to go back by car to their own home for a short holiday.

Now in this town in England was an auntie very dear to the kiddies, so what more natural than that we should make up for them a game showing the actual journey to see that auntie. Actual things that were happening on the road (such as repairs to main roads which necessitated other routes round tiny villages) were shown on the game, as were also certain misfortunes that might happen to a car such as punctures, running out of petrol, being held up with traffic signs, policemen, etc. Other roads were also introduced to enable the fortunate player to get ahead of his competitors.

The principal joy of this game was that it was real and it enabled those playing it to live over again one of the happiest experiences they had had.

NOW STUDY THE DIAGRAM AND FOLLOW THE INSTRUCTIONS.

You may make games such as this, and live over again your own happy adventures. To make such a game, first decide what your journey is going to be and, secondly, jot down on a piece of paper the main things to be seen or to be dealt with on the journey. Now take a large sheet of paper. First of all draw a series of double lines across its length, the distance



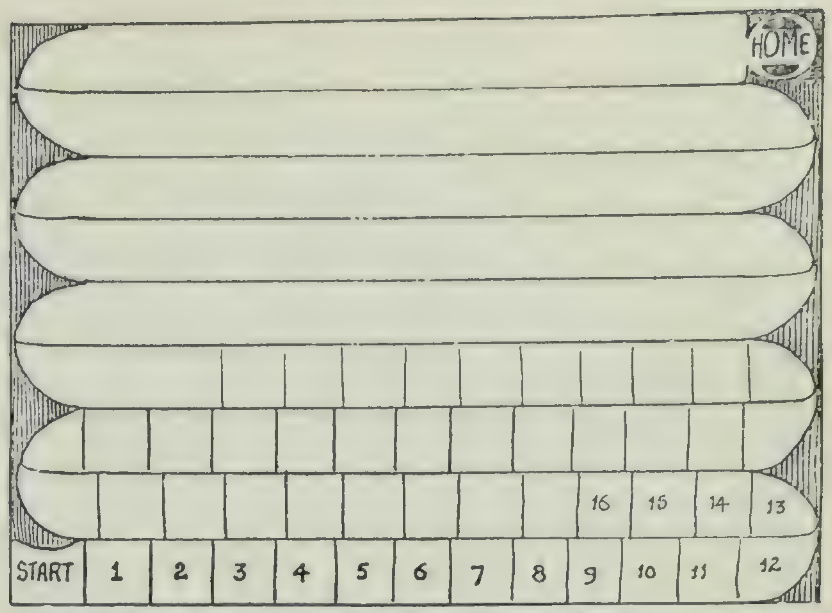
This is the game in which the children pretended to go to visit their favourite aunt. From this perhaps you can make one paying a visit to some one you love, and who lives far away. This design will show you how to draw the game.

between the lines being about 1 in. and the distance between each pair of lines being about 1½ in. Join up the lines at the ends in such a way that a continuous track is made from the bottom left-hand corner of the paper to the top. Now plan out in pencil the various obstacles and rewards, etc. Then divide the whole track into squares and number them.

Sometimes it is jolly to plan out the design of the game before deciding definitely what the subject is to be. The design, with its twists and curves, its circular " delays " and " short cuts," helps you to plan the " catches " that make table games so exciting.

DO NOT DESPAIR EVEN IF YOU CANNOT DRAW WELL.

The more you think about the plan of your game the more original and amusing you can make it. If you cannot draw well, cut out little figures from magazines and stick them in position where required. Figures from cigarette cards, being small, are very useful for this purpose as are also small scraps. Here are some suggestions for new games.



This sketch shows the simplest way of making the " track." After it is marked out the penalties and rewards may be added (the obstacles and the lucky squares).

From Cairo to the Cape.
Dick Turpin's Ride to York.
Our Last School Outing.
Our Journey to the Sea.
How We Found the Treasure.
With Scott to the South Pole.
A Trip on the Flying Scotsman.
Across Canada—West to East.

THE GAME OF GREAT ACHIEVEMENTS

HERE is a card game that is as interesting to plan and make as it is to play. It teaches and amuses, and great excitement prevails when the game is in progress with three or four players.

The only materials required are some post or correspondence cards. The number to be used depends upon the patience of the constructor, or the supply of cards available, but the best and most useful pack will be one of fifty-six cards.

HERE ARE SOME FASCINATING SUBJECTS FOR YOUR SELECTION.

Should you happen to be a good artist, and clever at lettering, then it will be an interesting task to draw and letter each card yourself. Pictures taken from books, and gummed into position on the cards, however, will serve the purpose quite well.

The idea underlying the game is that of taking eight well-known people in history, and selecting from their achievements the six most important or best known. Write the names down and under each name the six deeds or achievements chosen.

Thus, if choosing Horatio, Lord Nelson, you might put :

" Once tried to kill a polar bear.
Lost an eye and an arm in battle.
Defeated the French at the Battle of the Nile.
Once won a battle by his disobedience.
Gave the most famous signal in history.
Died on the *Victory* in the moment of victory."

or something like that.

MAKING AND BRIGHTENING UP THE CARDS WITH PICTURES.

Eight cards are now chosen, and on each of the eight is either pasted or drawn a portrait of the people chosen. The name is neatly printed under the portrait. Now one of the portrait cards is chosen, and six blank cards taken. On each of the six cards one achievement of that celebrity is printed. If some tiny sketch is added, giving some bearing on the deed, so much the better, for a picture helps to rivet the deed on the mind of the player.

When the eight great men or women have each six cards of " achievements " the cards are well shuffled and dealt out to the players. Three or four players will have more fun than is possible between two players, but two can play the game fairly well. The idea, of course, is to collect as many of the celebrities as possible, and to attempt to make up as many complete sets of " achievements " as you can. After the cards have been dealt, each player examines and arranges his or her "hand," grouping the celebrities with any of their achievements held in the "hand."

The game consists of players, in turn, asking any other player they wish, whether they have such and such a card. For instance, taking the cards referring to Nelson, a player might say to another, "Can you supply me with an eye and an arm, lost in battle ?" If the player asked can supply the card, he or she must do do. So the game goes round and round until at last one player can set down on the table seven cards, that is, a celebrity with all his six achievements. This player received ten points, and the game goes on until another player completes a set of seven cards. The game is complete when all players have got rid of their cards, and the points are : ten for each complete set, and five for each set of three or more achievements in an incompleted set.

Should a player find at the commencement of the game that he or she has no picture card (portrait) on which to build a set, that player must try to collect at least four of some celebrity's "achievements." This entitles the player to ask, when his or her turn comes round, for the celebrity (picture card) required. Such a card must be given up, but not until the player asking for it shows to the other players four of that celebrity's achievements.

It will be seen that a knowledge of history, or of science, etc., is necessary, according as the cards are historical or scientific. The player who masters the facts regarding the celebrities stands the best chance of winning the game.

A full list of the celebrities and their achievements should be provided for each player, for reference until all become used to the game. If a player is too long in deciding what to ask for, the other players are allowed to begin counting aloud, all together, and if the player has not decided to ask for something before the others have slowly counted ten, he or she misses a turn.

TEST YOUR BRAINS. CAN YOU ANSWER THESE?

1. Pennies are placed side by side to make a mile in length. What are they worth ? What is the value of a mile of halfpennies ?

2. How many times in the course of a day does the minute hand of a watch overtake the hour hand ?

3. A PERFECTLY BALANCED MAGIC SQUARE.

1	14	15	4
8	11	10	5
12	7	6	9
13	2	3	16

In this wonderful magic square, not only does each row, each column and each diagonal add up to 34, but there are 40 other groups of 4 numbers giving the same sum. Try to find them. Don't miss 8 Y-shaped groups like

1 15
11
7

nor 8 kite-shaped figures like 15
11 5

3

4. Arrange the figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 in such a way that they add up to exactly 100.

5. Look at the word REVIVER. It spells forward and backwards alike. Things like that happen in figures. How do you square a number ? Yes, you multiply the number by itself. Well, multiply 101 by 101, and the answer is 10,201.

The square of 101 is 10,201.
The square of 111 is 12,321.
The square of 121 is 14,641.
The square of 202 is 40,804.
The square of 212 is 44,944.
The square of 307 is 94,249.

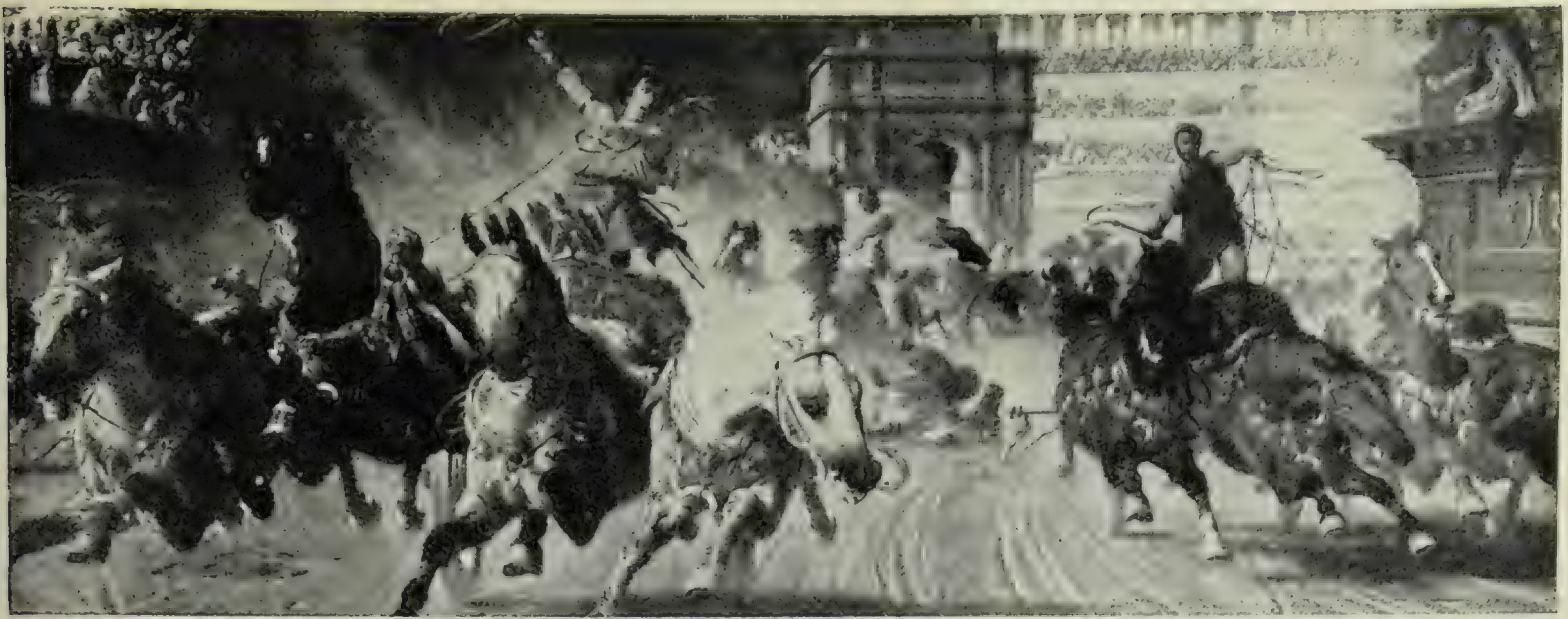
All these 5-figured squares read the same backwards and forwards. One has been missed out on purpose. It begins with 6. Can you find it ?

6. Replace the noughts in the number 60,801 so that the number you make will be exactly divisible by 79.

7. A and B are two towns at a distance of 10 miles from each other. Y and Z are two cyclists who travel at the rate of 10 miles per hour. Y starts from A to B at the same time as Z starts from B to A. All the time that they are cycling a fly flies at the rate of 40 miles per hour from one to the other to and fro until they meet. How far does the fly fly before the cyclists meet ?

8. If it takes 6 seconds for a clock to strike 6, how long will it take the same clock to strike 12 ?

(For Answers see page 340)



Exciting scenes were witnessed in olden days in the great Colosseum at Rome. Chariot races drew crowds to the galleries to watch the horses dashing round the arena. Great strength was needed to manage the teams.

WHY WE SHOULD KNOW HISTORY

By MARJORIE BOWEN

The famous historical novelist.

HISTORY is a dull word, it sounds like a lesson on something that no one cares very much about. But if you think a little, you will see that we are all part of history, and that everything around us that we use, see, or feel the effects of, has its place in history. All the exciting stories you have ever read, and all the queer things you have seen pictures of, come out of history, and there are hundreds more stories and pictures waiting for you to discover for yourself. Some one says a chance word, or you happen to read an odd sentence, then you say to yourself "I wonder what the history of that is? What was his or her story?" Then you try to find out more for yourself, and you perhaps get hold of something that may fill your mind for years, and make everything you think and do quite different from what it was before.

We ourselves are the result of history; a very great many people had to work, suffer, and even to die violently to give us benefits that are now so common that we do not notice them. Our forbears had to fight hard to be allowed to get the knowledge which is now so easy to obtain, and which now is almost despised. It is hard to realise that not so very long ago people in Europe were not allowed to think as they liked, they had to *pretend* to think like those in power. Because of the long fight of a few people who were often horribly ill-treated, we have now the right to think as we please. Because of the long labours of other people, we have now better health than our ancestors, and when we are ill we do not suffer so much. It took a long struggle, too, to show cruelty as the hideous thing it is, and to create that sentiment we have now, which makes us very sorry and ashamed that weak, unfortunate people and animals should suffer. At one time only a few troubled about the pain of others, and they had to work hard to bring their ideas forward.

All these stories of how such great changes came about, and how men and women adventured and suffered to get this work done, is in history. We are their heirs, and when we read of what they did it makes us understand that there is a great deal that still needs doing, and that it is quite possible for us too, to help. We are the heirs also of the people who made things with their hands, things that we now enjoy without noticing them; some one once had a thought, and when he had done with his thought it was a creation or invention, just as Sir Oliver Lodge once had a thought, and when he had worked it out, it was the wireless wave.

History tells us of every one who ever thought of anything worth while, and all the adventures and struggles each had till his thought was perfected; all the failures and disappointments, too, for very often it took the lives of several men before the thought was complete, and ready to leave to us to use and benefit by.

Marjorie Bowen

Then there were the people who had dreams of something grander and more beautiful than anything that they could see around them, and these tried to leave us a record of their dreams. So they built, and wrote poetry and music, carved and painted, and what is left of their work is very highly prized, for it shows us that a man's dream goes on long after he is dead, like the ripples go on spreading on a pond long after the pebble that caused them has sunk to the bottom. They also, the men who did these things, belong to us, and as we look very eagerly at, and listen to, what they left behind, we feel how much the same they were as we are, and all our own dreams and ideas grow sharp and clear, and we long to learn how to express them so that others may share them. A great poet wrote:

" No profit goes where no pleasure's taken,"

and that is true the other way round. If you are really learning something, finding out even a little of all the marvels and wonders there are in the world, you must be getting some pleasure too, and it is really the most exciting sort of pleasure of all, for it is making you yourself more important, more interesting and more keen to do some work of your own. Every one knows that only by doing work you like, will you really feel satisfied and happy.

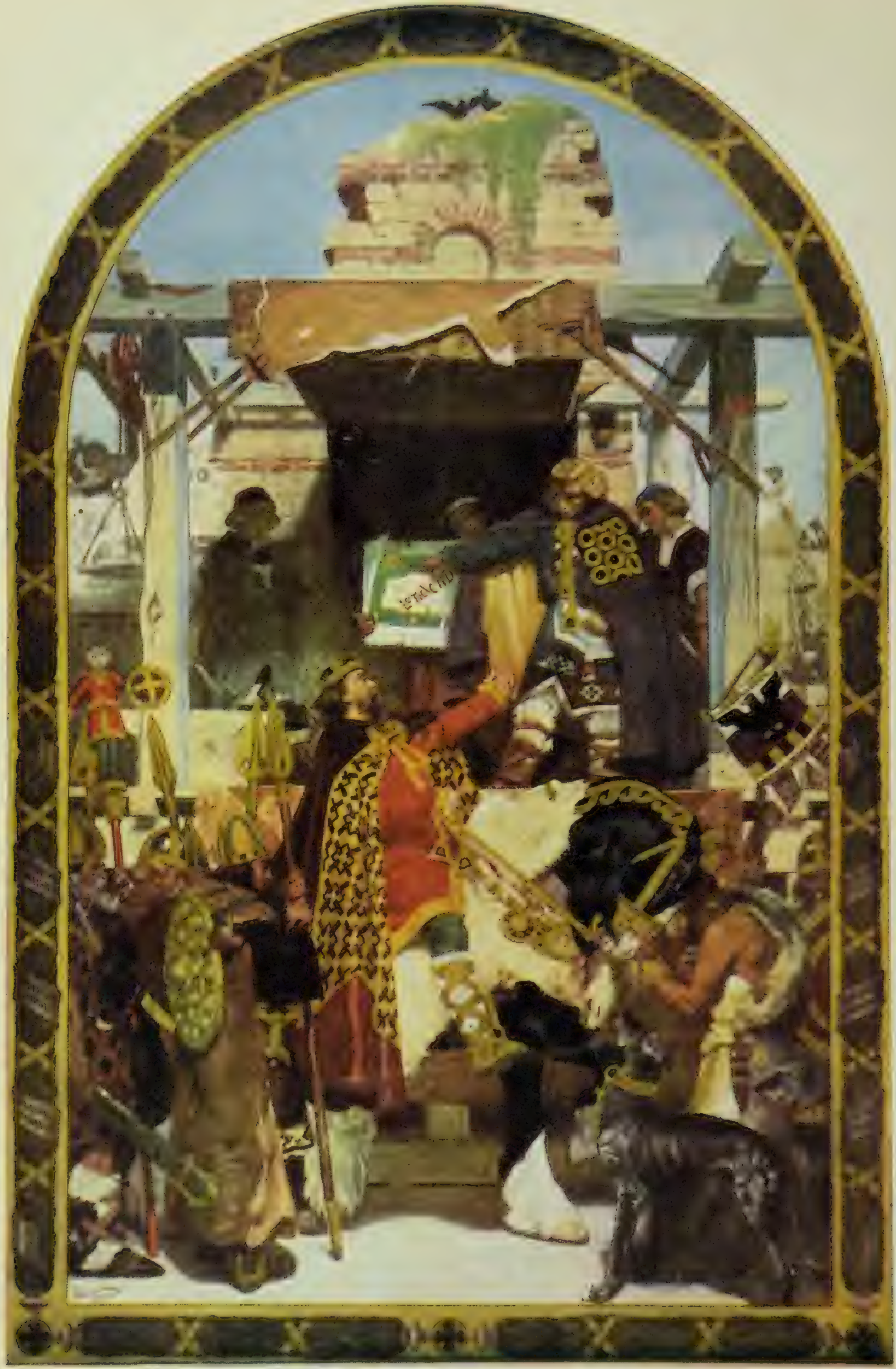
History includes all these artists—the painters, musicians, architects and poets, and tells us not only how they struggled to leave behind some trace of their dreams, but how they altered history itself, and how, at some periods, whole countries thought more of them and their lovely creations than they did of battles or governments or the quarrels of those who loved power.

We like to read of the adventurers who go far away and bring marvels home, and if we stop to ask we shall find that very many objects about us come from the other ends of the world, and that they were, in the first place, brought here with great difficulty and peril. Nearly all the flowers in our garden were brought here to us by men who cared most for this kind of beauty. In the same way our island has been enriched for two thousand years with products fetched and sent from all over the world; and we, in turn, have sent out our treasures to foreigners. And the history of this—commerce—is in itself most exciting.

It has taken up a great deal of the energies and talents of mankind, and survived the ruin of wars and quarrels and ignorant misunderstandings. Thus to-day, by art and commerce and all that they mean, it is even hoped to prevent war and fear of war in the future, so that there will be more time for us to enjoy the earth that belongs to us. How we came to this frame of mind is, again, part of history. We ourselves are the result of history, and if we do not know anything about what made it, what we are, and cannot understand the reason of the state of affairs we see about us, we are handicapped.

Therefore, it is worth while to give a little of your time to history, just to find out how you came to be what you are, and to be able to discover the reason for much that you notice and that seems, on the face of it, rather queer.

Marjorie Bowen



KING ALFRED REBUILDS THE WALLS OF LONDON.

King Alfred conquered London in the year 836 and immediately set to work to fortify it against his enemies. The new city wall was its strongest defence.

Fine Arts

Facing page 181

Nature gave to man the fruits of the earth. Here in a Nigerian market we see some of them on sale.

THE THINGS AROUND US

THE THINGS WE NEED: FOOD, DRINK, HOMES

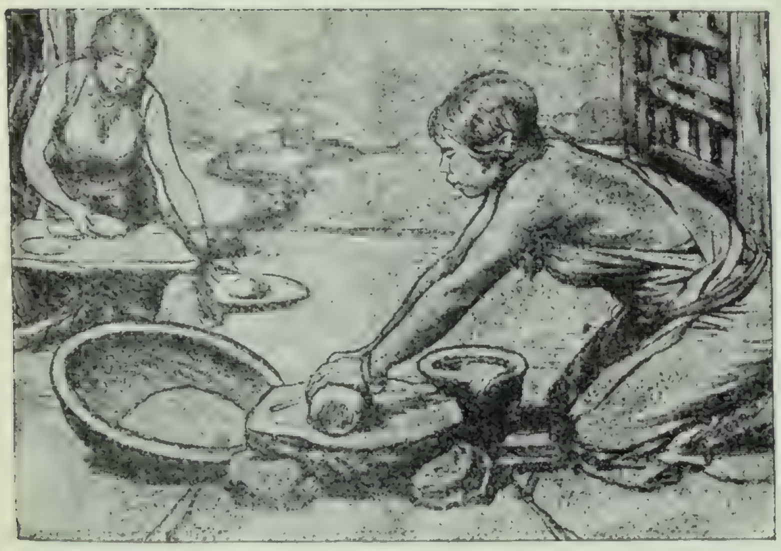
We are all so used to the things around us, our houses and furniture, our food and clothing, the streets and buses, the policemen and the postmen, that we do not think they are anything to wonder at. We do not think the big shops at all marvellous, and we do not even wonder how the doctor knows how to make us well, or how our statesmen are able to govern our country, or our architects and engineers plan our buildings, roads and railways. But there was a time when people had none of these things. It is only through the thought and work of many generations of people that these things have come to be, and it is only by knowing about the changes that have taken place in the ages through which people have lived and worked in many different countries that we can see the wonder of everyday things. In the following section we shall look at some of these.

HOW would you like to get up in the morning and go out and hunt for your breakfast before you could have it? This was what Kali and his father had to do many thousands of years ago. Kali, however, thought it was quite fun hunting for breakfast. Sometimes he gathered nuts and seeds and berries; sometimes he killed wild animals with his little bow and arrow. If he met a large animal, his bow and arrow were not much good; then his father used his big bow or a long spear with a flint head instead. Sometimes for a change they had fish; they had to walk many miles to the river to catch them.

One sunny spring day, in the open ground before his home, Kali found lots of little green blades springing up. He puzzled his head about them, and then he remembered that last autumn, when he was bringing in seeds to store for winter food, he had dropped some of them at this place. All through the summer Kali and his father and mother watched the little green blades grow into big plants, until at last they could gather seeds from them.

Then Kali's father thought of a grand scheme. Why not get lots more seeds and spread them all over the open spaces? Then next year they would have plenty of seeds without going into the woods every day to gather them. So Kali spent long days gathering all the seeds he could find, while his mother broke up the hard surface of the ground with a stone hoe. Then his father scattered the seeds, and when the next summer came, there was quite a large field of corn. For it was wild corn that Kali had gathered and dropped on his way home.

When they had lots of seeds, Kali's mother began to think how she could make them pleasanter to eat, for they were very dry and hard in their husks. She took two flat stones and ground the corn between them. She ground the husks as well as the kernel, so that the flour she made was brown and gritty, not soft and white as ours is. Still it was better than the whole seeds. Then she mixed it with wild honey and made it into a cake which she baked between stones in the ashes of the wood



Baking-day! The people long ago, in the days before electricity made cooking simple, crushed the wheat on stones before baking it over an open fire outside their rough caves.

fire. This coarse, sweetish bread was much nicer to eat than dry seeds.

To-day all over the world people eat bread, rye bread and barley bread as well as wheaten bread, black, brown and white, baked in large ovens into crisp square loaves or crusty, knobby ones. And it all began with a wood fire, and two large stones, and corn sown by hand in almost unturned ground, many many thousands of years ago.

Have you ever thought what we should do without meat and milk, butter and cheese? Yet there was a time long ago when people had no milk because they had no tame animals, and the only meat they ate was the flesh of the wild animals they hunted. At first they ate this raw; then they learned to cook it in a clay pot hung over the fire or in a hole in the ground filled with water heated by putting hot stones into it.

It was not only very early people like Kali's father who hunted their food; all through the ages people have done this. In Egypt long ago the great nobles used to have grand hunting parties when they killed gazelles and ibexes with spears, throwing-sticks, or bows and arrows. Often too they went out in light little boats among the marshes of the Nile Delta to kill wild birds, and then they took a cat with them!

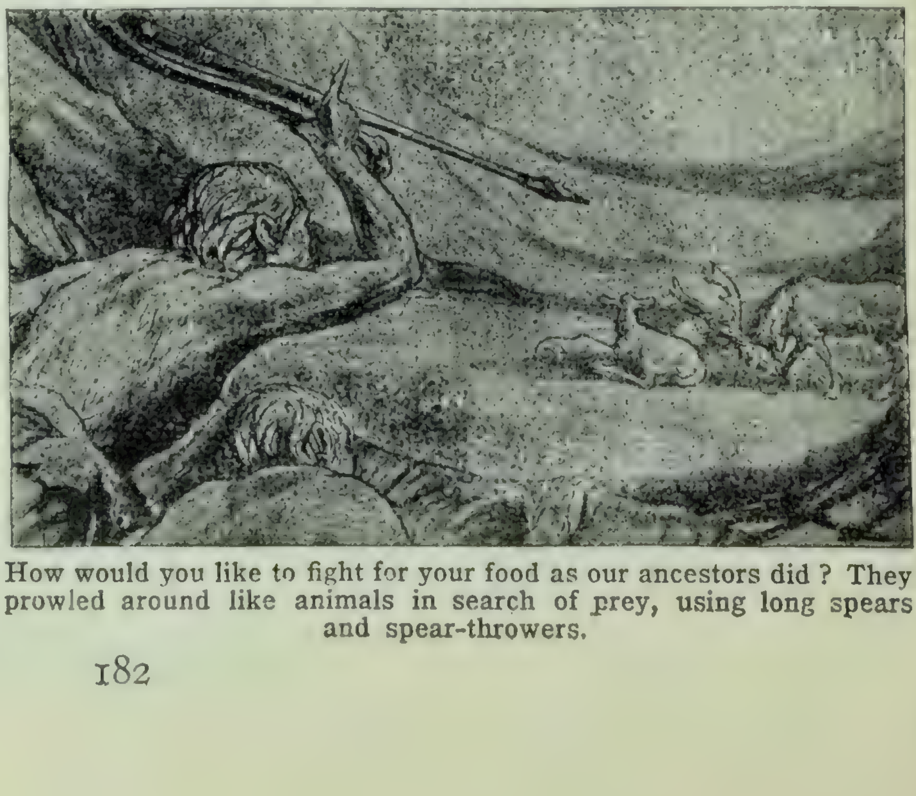
In our country in the Middle Ages great lords and ladies went out hunting for amusement as well as to get things to eat. If they were going to hunt a fierce animal like the boar, which lived then in our forests, the men went alone, because it was a dangerous sport. If they were going to hunt deer, they went on horseback with dogs, and shot the deer with their bows and arrows. The flesh of the deer was called venison, and it is still eaten in many countries to-day. Ladies went with them when they were going to hunt smaller things like wild birds. They all rode out in the early morning with hooded falcons perched on their wrists, and when they saw their prey, they unhooded and loosed the falcons to follow it and bring it down.

We still eat the flesh of small wild animals like hares and rabbits, and of many wild birds, but most of our meat is the flesh of animals specially bred for the purpose. Some of it we breed at home, but by far the larger part of it comes from overseas. This has only been possible since we learnt how to keep meat from going bad by freezing. You have all seen chilled and frozen meat in the butcher's shop, I expect. But you would not have seen it there fifty years ago.

HOW ANIMALS WERE TAMED TO PROVIDE FOOD.

If people had not learnt how to tame animals, we should not now be able to get meat from all over the world. It happened about the same time as people learnt to grow corn. In the long, hard winters they found that the wild animals would venture near their huts in search of food. So they encouraged them to come closer and closer by putting food down for them, and then caught them with ropes and set to work to tame them. They tamed goats and sheep and oxen, and later pigs. They tamed birds too; in Babylon and Egypt they had flocks of geese and ducks, and the Romans kept hens at their country houses.

At first people did not often kill these tame animals for food, for they were too useful for



How would you like to fight for your food as our ancestors did? They prowled around like animals in search of prey, using long spears and spear-throwers.

other things. The sheep gave them wool to make cloth, the goats and the cows gave them milk to drink, and soon they learnt how to make butter and cheese. But as they got more and more animals, they found they could afford to kill some of them and eat them. For many centuries a man had to kill most of his animals in the autumn, because the only food he had for them was hay and he had not enough of this to last the whole year round. That was why the salt that we buy so cheaply to-day was such a precious article in olden times. It was needed to salt the meat to keep it. Even so, the meat did not keep very well, and then it had to be spiced to make it taste pleasant. So the little nuts and powders mother keeps in her store cupboard were greatly needed, and many people made fortunes by sailing away to the East to the Spice Islands, and bringing back cargoes of spices.

It was not until about two hundred years ago that people were able to have fresh meat in winter as well as in summer. Then an Englishman, called Coke of Holkham, began to grow root crops, such as turnips and mangolds, in large quantities. These could be stored to feed the animals during the winter, so that they no longer had to be killed and the meat salted. We are so used to having fresh meat every day now that we do not think it at all wonderful ; but if you had lived in the reign of Charles I. you would have been very surprised indeed. And you would have been still more surprised to learn that lamb could come from New Zealand and beef from the Argentine.

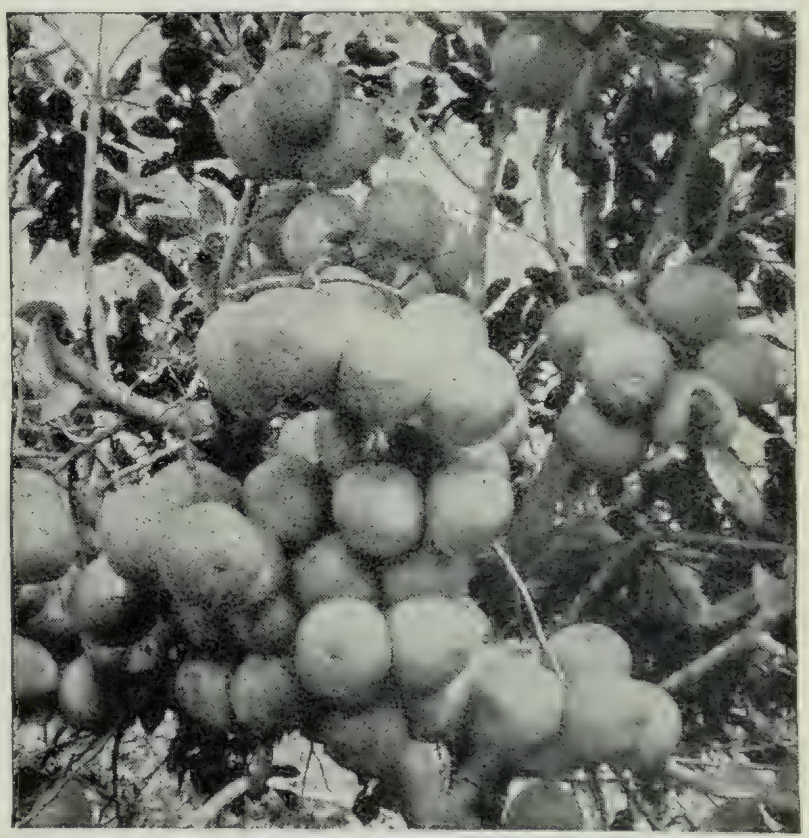
SOME MARVELS OF OUR FRUITFUL EARTH

How did we get our Fruits and Vegetables?

"JOHN," said his mother, "run into the garden and pick some peas for dinner." John took the basket and went off obediently. It was a jolly garden full of all sorts of vegetables and fruits. There were apple and pear trees, plums and cherries, prickly gooseberry bushes, raspberry canes and red and black currants. Besides peas, there were beans and potatoes, and little cabbages planted ready for the winter, and rows of lettuces and onions. As he picked the peas, John began to wonder where all these things came from, and whether people had always had them to eat. How dull dinner would be with only bread and meat, and how he would miss the crisp, sharp apples and the big juicy pears. And if there were not any currants and gooseberries, there wouldn't be any jam for tea.

When his father came home in the evening John asked him to tell him about these things. "Well," said his father, "in the beginning they all grew wild. They were not as big and pleasant to taste as those we have now, but when people began to grow them in gardens, just as they began to grow corn in fields, they soon became bigger and better. They manured the ground and chose the best seeds to sow and found out new varieties." "Oh," said John, "just as they do in the nursery gardens up the road ?" "Yes," replied his father, "they are called nursery gardens, because they nurse the plants there to make them grow healthy and produce fine fruit."

John thought for a few moments, then he asked "What vegetables did they grow first, father ?" "Let's get a book and find out," answered his father. So they found a book that told them all about fruits and vegetables.

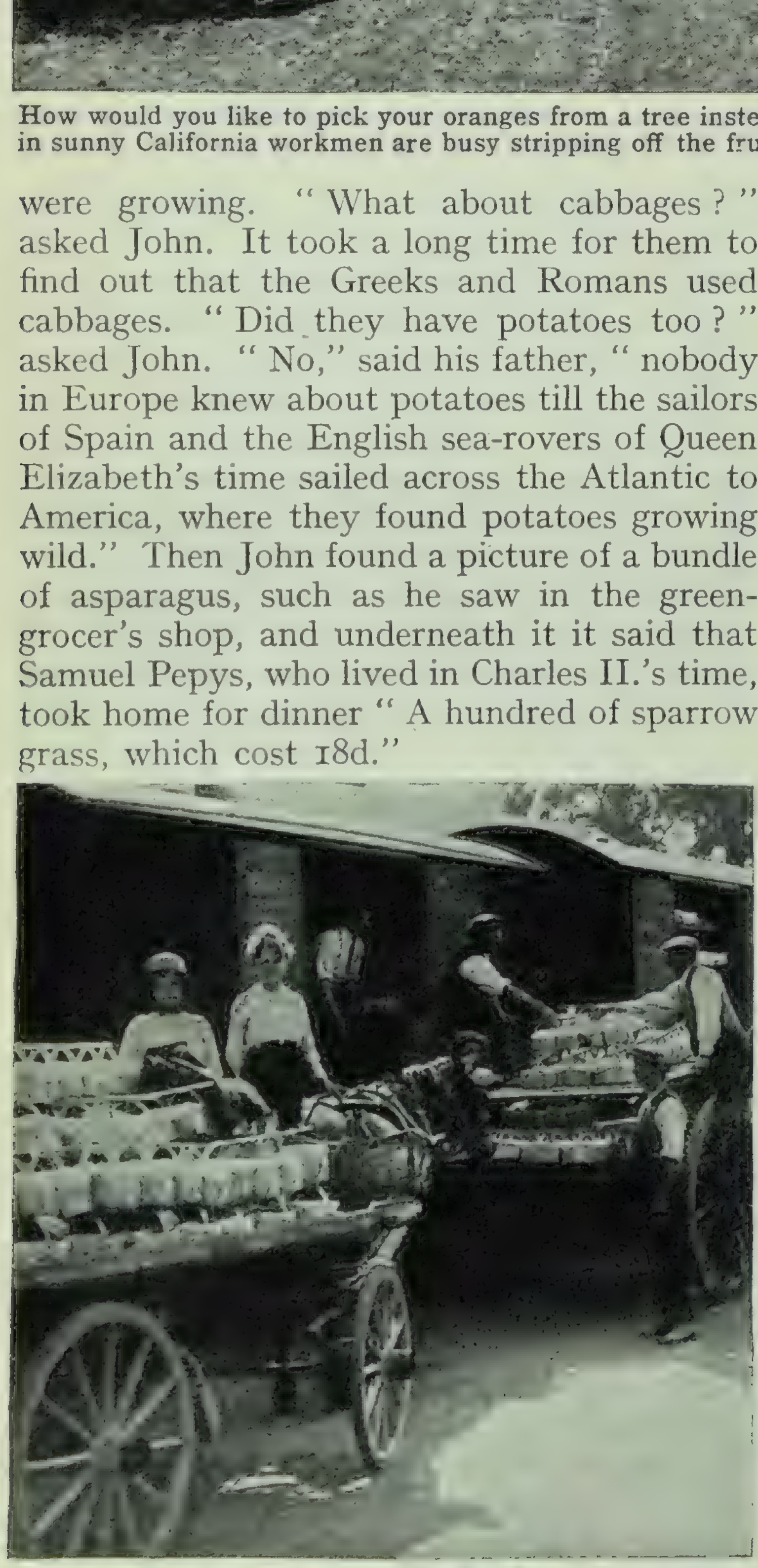


Many of us who see grape-fruit on our breakfast-tables each morning have little idea what this delicious fruit looks like when growing in its natural state. It grows in great profusion, in smooth, golden clusters, truly a beautiful sight.

They read first of all how onions had been grown in Babylonia five thousand years ago. "What a long time people have eaten onions !" said John. They then found out that they had eaten peas and beans and cucumbers just as long, for there was a picture of a garden in Egypt where all these things

How would you like to pick your oranges from a tree instead of receiving them over the counter? In the orange-groves in sunny California workmen are busy stripping off the fruit before packing it in boxes ready for export to other lands.

were growing. "What about cabbages?" asked John. It took a long time for them to find out that the Greeks and Romans used cabbages. "Did they have potatoes too?" asked John. "No," said his father, "nobody in Europe knew about potatoes till the sailors of Spain and the English sea-rovers of Queen Elizabeth's time sailed across the Atlantic to America, where they found potatoes growing wild." Then John found a picture of a bundle of asparagus, such as he saw in the greengrocer's shop, and underneath it it said that Samuel Pepys, who lived in Charles II.'s time, took home for dinner "A hundred of sparrow grass, which cost 18d."



Getting ready for the market. Loads of strawberries from Somerset are being packed up for their journey to be sold at the London markets. How would you like to help?

John was going to find out about other vegetables, but his father said, "Nearly bedtime, John, what about fruit?" So they spent the rest of the time reading about fruit. John was very excited to find that the sweet, brown dates he liked so much, and the little green grapes that grew in his grandfather's greenhouse, had grown long ago in the open in Babylonia and Egypt and on the sunny hillsides of Greece. He found out that apples and pears and plums had been brought to England by the Romans, and that a boy in Elizabeth's time would have all these, and figs and mulberries and walnuts, as well as oranges, brought from the sunny south. "Would he have gooseberries and currants too?" asked John. "Perhaps," said his father, "but he would be a lucky boy if he did, for they had not been known in England long then. But he would have strawberries, for these grew wild in the woods, and people brought in the plants and cultivated them under the trees in their orchards."

SOME NEWER FRUITS WHICH COME TO US FROM DISTANT LANDS

"Oh, what about bananas?" asked John, looking at the one his mother had put on his supper plate. "Well, we haven't had those very long," replied his father, "because they grow in the West Indies, and until we built big steamships to bring them over quickly, they were not eaten in England. And I can remember when one fruit we eat now was first sold in the shops."

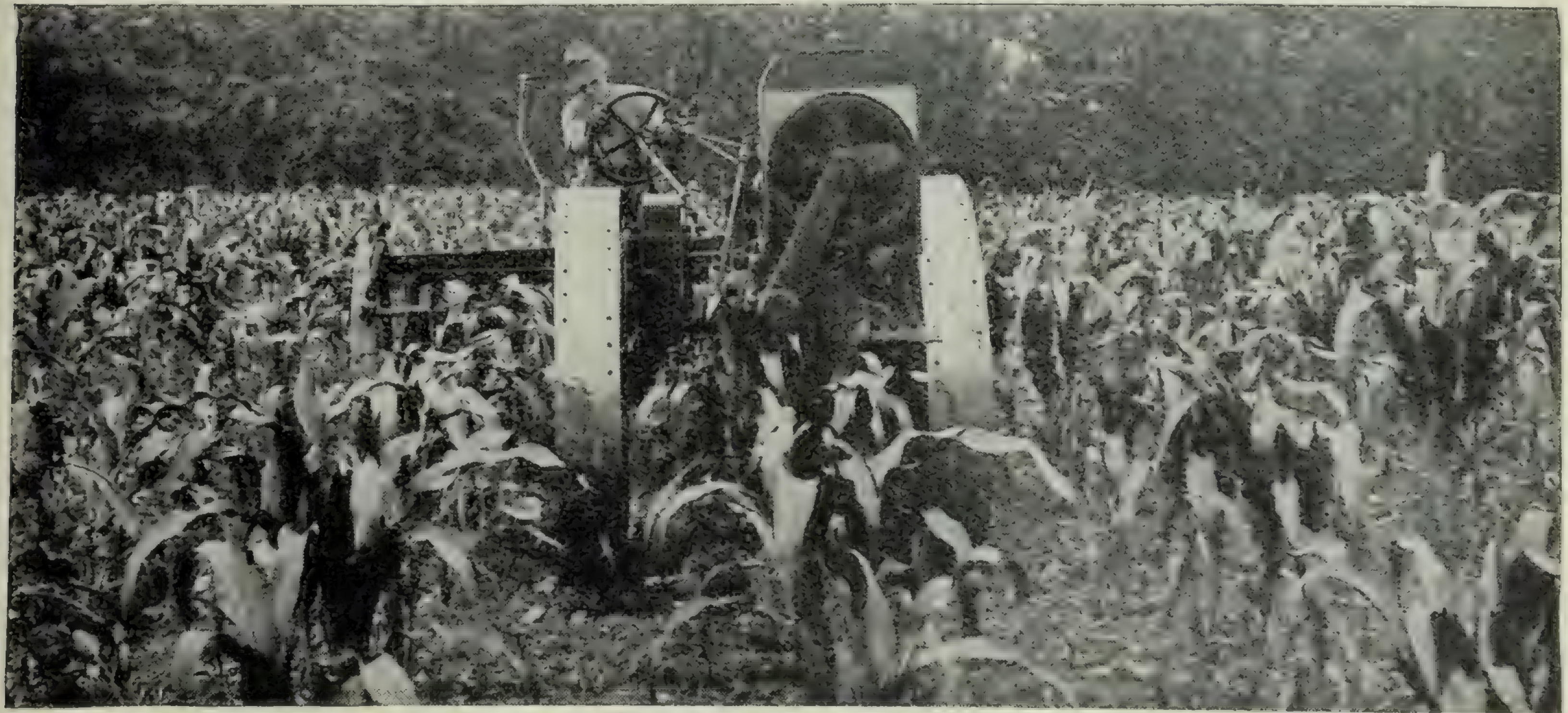
"What is that?" said John. "The grapefruit," replied his father, and promised to bring home a grapefruit next day for John to eat.

GATHERING THE HARVEST IN SUNNY CLIMES

How our tea looks before it reaches the pot. These natives are spraying the plants to keep them healthy.

Coffee-beans basking in the sun before being graded for market.

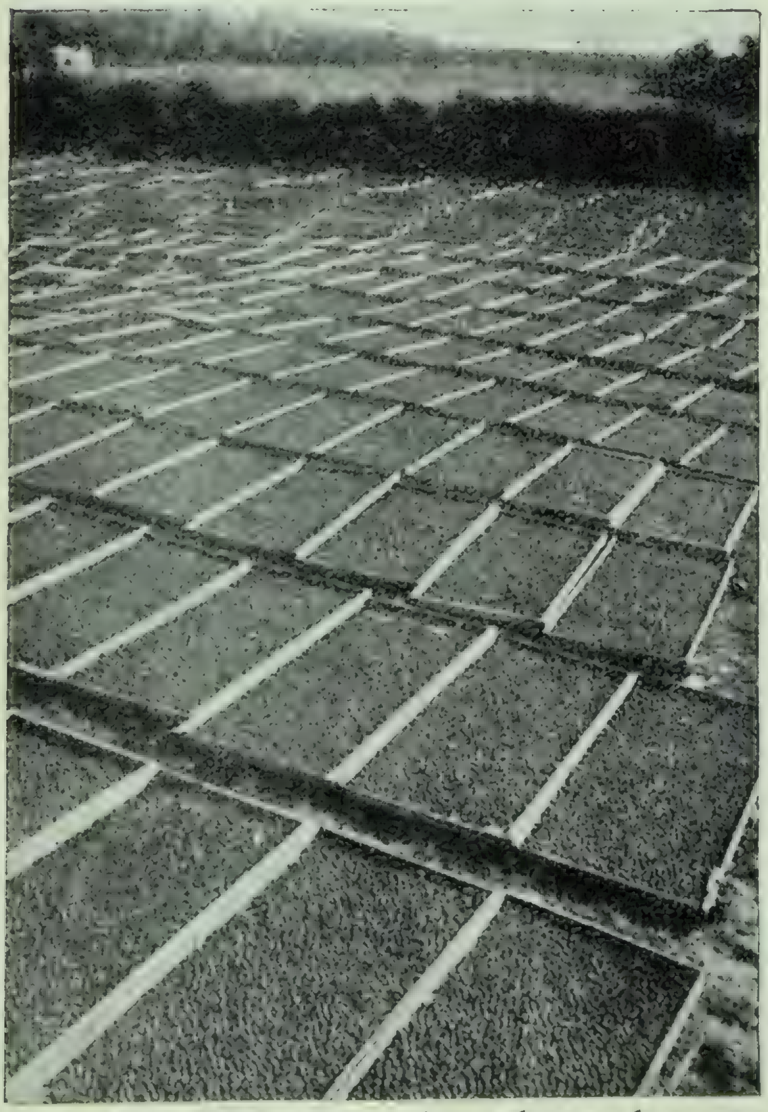
Natives busy with the cocoa harvest in sunny Ceylon.



This leafy crop of maize, or Indian corn, which we see being harvested in America, is used extensively for food.

COUNTLESS FRUITS REPAY THE GROWERS

Before they reach the shop-window! This harvest of grapes is part of the day's yield in a South African vineyard.



Sun bathing! This interesting picture shows us how some fruits are spread out in large quantities to dry in the sun.

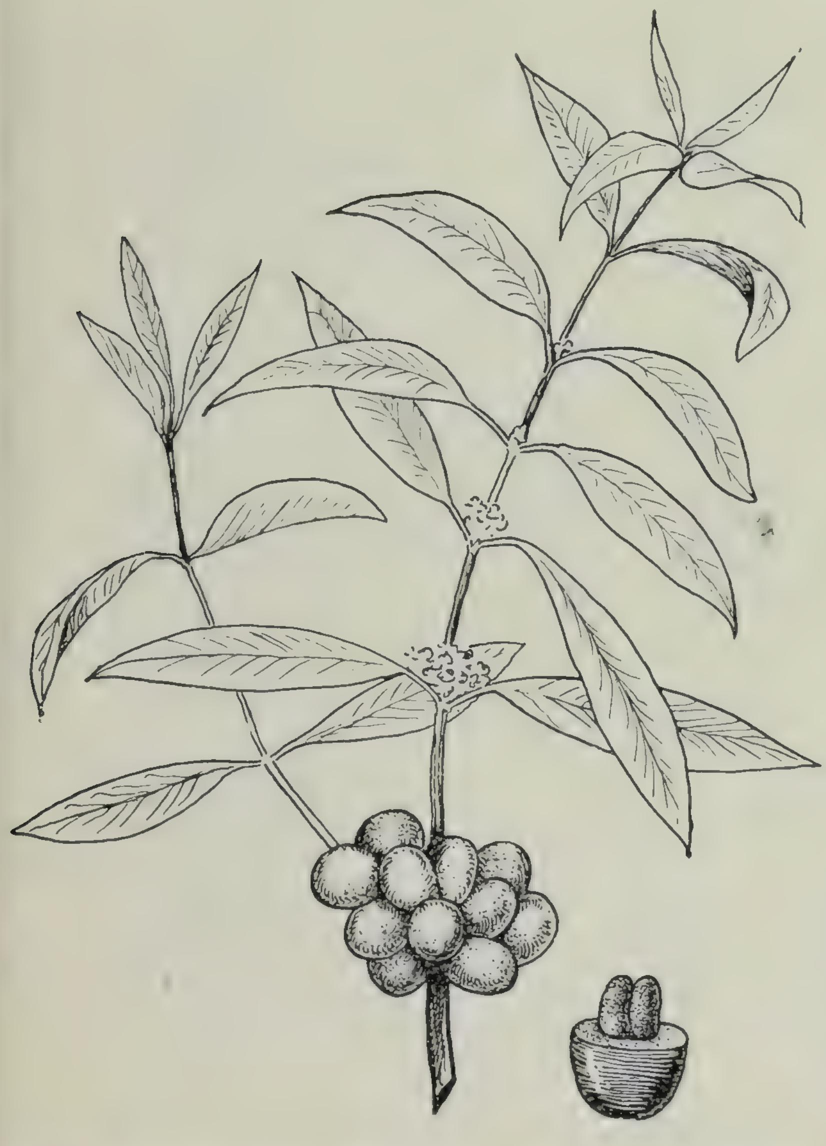
A paradise of fallen fruit! In this Devonshire orchard we see a shining carpet of cider apples ripening in the sun.

TINY PLANTS WHICH GIVE US DRINK

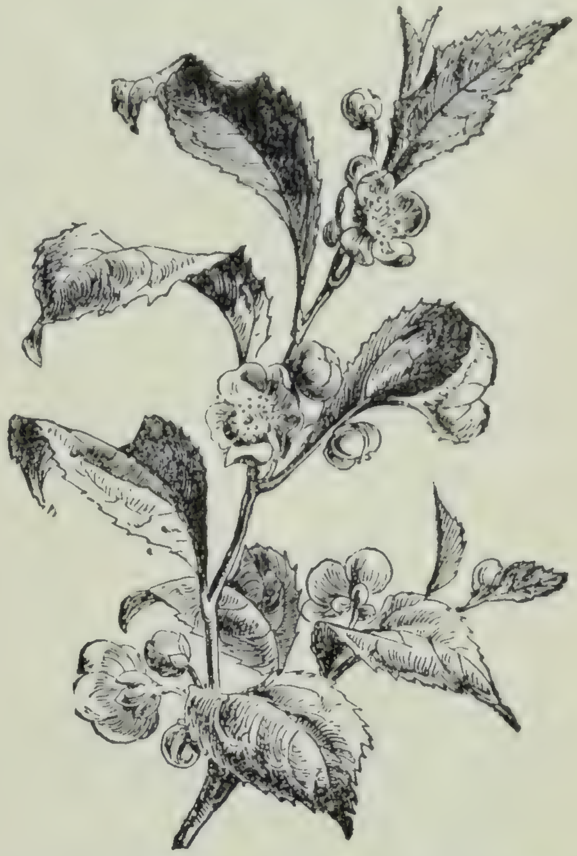
WHAT should we do without tea? Yet three hundred years ago, most English people knew nothing about it. Their common drink, besides water, was beer. People had known how to make beer from early times, ever since they had learnt to grow barley and to crush it and leave it to ferment with water till it became quite strong and intoxicating. People drank it for breakfast as well as dinner and supper. Even children drank it as well as milk, because it could be made at home and so was easy to get when people had very little money.

A POPULAR HOME-MADE BREW WHICH THE PEOPLE DRANK LONG AGO.

Another drink used by English people in olden days was mead, which we do not have nowadays. It was made of honey, mixed with water and all sorts of spices, and left, like beer, to ferment until it was sweet and strong. Well-to-do people drank wine also. Wine made from grapes had to be brought from abroad, because the vine would not grow in the cool English climate, but there were all sorts of home-made wines too, elderberry, dandelion and cowslip, as well as cherry and ginger, such as we still sometimes find people who live in the country make to-day.



The coffee-plant, from which we get another popular beverage. This plant first came to our country from the East.



We rely on this dainty little tea-plant to provide us with the refreshing drink which is universally popular.

In the sixteenth century Englishmen began to sail to the East, where the tea plant grows. They brought back amongst other things cargoes of tea-leaves, and since that time people have drunk more and more tea. At first it was very dear, so that only rich people could afford it. Ladies drank it with their friends in their parlours, and people in Victoria's time used to have "a dish of tea" before they went to bed, because they had supper so much earlier than we do. Poor people still drank beer. But when we got more and more ships to bring tea to England, it became cheaper, so that we can all drink it to-day.

THE DAYS WHEN THE COFFEE-HOUSE WAS SO POPULAR.

About the same time as tea became known in England, people began to drink coffee and chocolate, which is the same kind of drink as our cocoa, only thicker and richer. In Queen Anne's time there were places called coffee houses, where gentlemen used to go to talk about politics and to tell the news, and to play games like chess, cards and backgammon. Rich people gave up the habit of drinking beer for breakfast, and had cups of chocolate instead. Tea, however, was very expensive in those days. The coffee and the cocoa bean came also at first from the East, but now they are cultivated in many other places as well, and there are always plentiful supplies coming to England from overseas. So we can all drink coffee and cocoa to-day, as well as tea, and many other drinks like lemonade and ginger-beer, which people did not know about in olden times.

HOMES AND HOUSES THROUGH THE AGES

THE first home was a cave. It was not a particularly nice home, for it was dark and cold, and one could not have a fire in it, because there was no opening through which the smoke could get out. Soon men began to think about making better homes. As they had not any bricks or concrete, they had to use what they could find, and they built their homes in all sorts of funny ways.

HOW THE FIRST FATHERS AND MOTHERS PLAYED AT "HOMES."

Have you ever played at being fathers and mothers and made a home for yourselves in the woods with bushes for walls and branches overhead for a roof ? This was the way in which the first fathers and mothers made their homes. They set to work to dig a hole in the ground, just as you do in the sand at the sea-side, only their hole was much bigger. Then all round the edge of the hole they set short poles, saplings or stout twigs uprooted from the woods, and between the poles they intertwined thin twigs or rushes from the river to make a sort of basket work. They plastered this all over with mud and made a roof of twigs covered with bracken and heather. They left a hole for the door and a hole in the roof for the smoke from the fire to escape.

This wasn't a very good home, but it was better than a cave ; and soon people improved their homes. They got longer poles, so that they could make the walls higher and they did not need to dig a hole. They became quite clever at weaving and plastering, so that they were able to keep the rain out, and to make their homes snug, even though they *were* smoky.

WOULD YOU LIKE TO LIVE IN THE MIDDLE OF A LAKE ?

This sounds a funny thing to do, doesn't it ? But in the days when fierce wild beasts roamed over the land, people used to live on lakes and marshes because they were safer there. They drove wooden piles into the bed of the lake and made a platform on which they built their houses. In some places remains of quite large lake villages have been found by archaeologists, men who spend all their time digging in the earth to find out how people lived in olden times.

In cold parts of the world where there was much ice and snow, the people used blocks of snow to make their homes. They have gone on doing this ever since. Even to-day the Eskimos build huts of this kind. They are very solid and not easy to move once they are built. Very different are the homes of the people who live in the hot sandy deserts of Arabia. These are just goatskin tents which their owners can pick up and carry away with them as they move about finding fresh supplies of food and water. Tents have always been used by wandering peoples ; Abraham would have used just such a tent on his journey from Ur to Canaan.

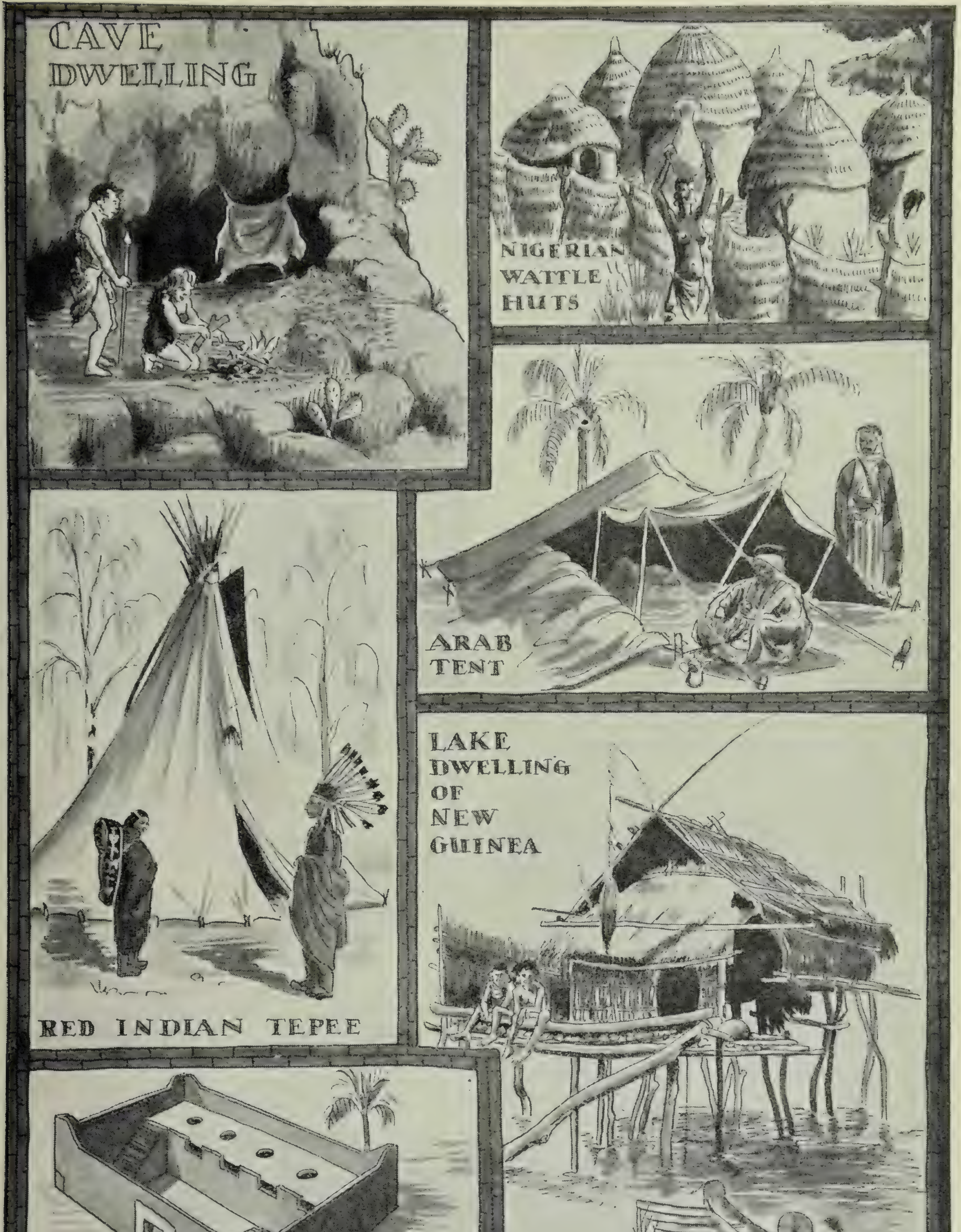
In these first homes there was not any furniture. There wasn't room for any, you see. All the family had to live in this one-roomed house, and in bad weather the animals would have to use it too. Heaps of rushes for beds, perhaps some flat stones for seats, clay pots for cooking, weapons for hunting, and flint axes, hammers and hoes—these were the chief things to be seen in the first homes.

HOW WE CAN BUILD HOUSES WITH DAMP CLAY BAKED INTO BRICKS.

Do you remember how the Israelites were set to make bricks by Pharaoh ? Have you ever thought what the bricks were for ? They were to build houses. It was in Egypt and Babylonia that the first brick houses were built. This was at least five thousand years ago and people have gone on building brick houses ever since.

Have you ever seen bricks being made, how they are fashioned of wet clay in a mould, and then baked in a kiln or a clamp ? You can see this being done any day if you live near a brickfield. The ancient Egyptians and Babylonians made their bricks in much the same way, only they were larger and squarer and were sometimes baked in the sun instead of in a kiln. In both Egypt and Babylonia there were very few trees, so the people could not get poles and twigs to make their walls. But there were big rivers fringed with reeds, so at first they made their houses entirely of reeds. Soon they found out how to make bricks for walls from the damp clay of the river bank, and used the reeds for thatching.

CURIOUS HOMES OF YESTERDAY AND TO-DAY

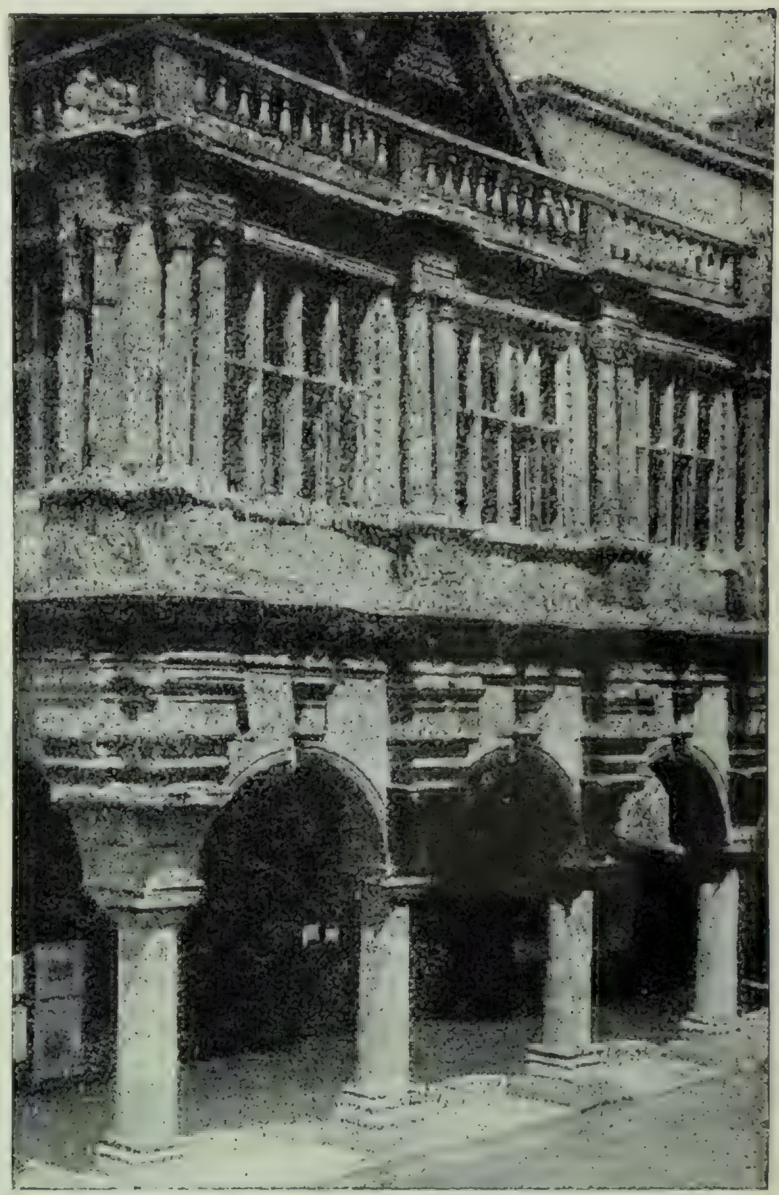

CAVE DWELLING
NIGERIAN WATTLE HUTS
ARAB TENT
RED INDIAN TEPEE
LAKE DWELLING OF NEW GUINEA
ANCIENT EGYPTIAN BRICK HOUSE

The brick houses which the Egyptians and Babylonians built were much better homes than twig and mud huts. They generally had a number of rooms, either opening on to a courtyard, or surrounded by a garden. Some of them had a second storey, with doorways opening on to a gallery running round the courtyard. They did not make many windows because the sun in the East is so hot that people want to keep it out of their houses, and besides, they had not any glass for windows five thousand years ago. In Egypt houses had flat roofs of timber covered with plaster, and little brick staircases running up to them, so that the people could use them as open air sitting-rooms. The walls of these brick houses were usually plastered over, because the bricks, which were not so well baked as ours are, crumbled very easily.

WOULD YOU LIKE TO PEEP INSIDE AN EGYPTIAN HOUSE?

In these houses people lived quite comfortably. There was a kitchen with a brick fireplace where the cooking was done, and a large room where the master of the house received his visitors, and bedrooms for the family. They were quite well decorated too. In many Egyptian houses the plastered walls of the rooms were painted with garlands of flowers and fruit. If the room was a large one, it had carved and painted pillars to support the roof.

There was quite a lot of furniture too in these houses. In Babylonia people used stools and little tables made of rushes as well as beds with wooden frames and rush bottoms, and lots of pots and bowls for cooking, and drinking cups and jugs made of clay and alabaster, and even, in rich people's houses, of gold and silver. In Egypt, people often had wooden furniture very beautifully carved, and painted, beds, tables and chairs and large chests. They had cooking vessels of bronze, silver spoons, and knives with carved and jewelled handles.

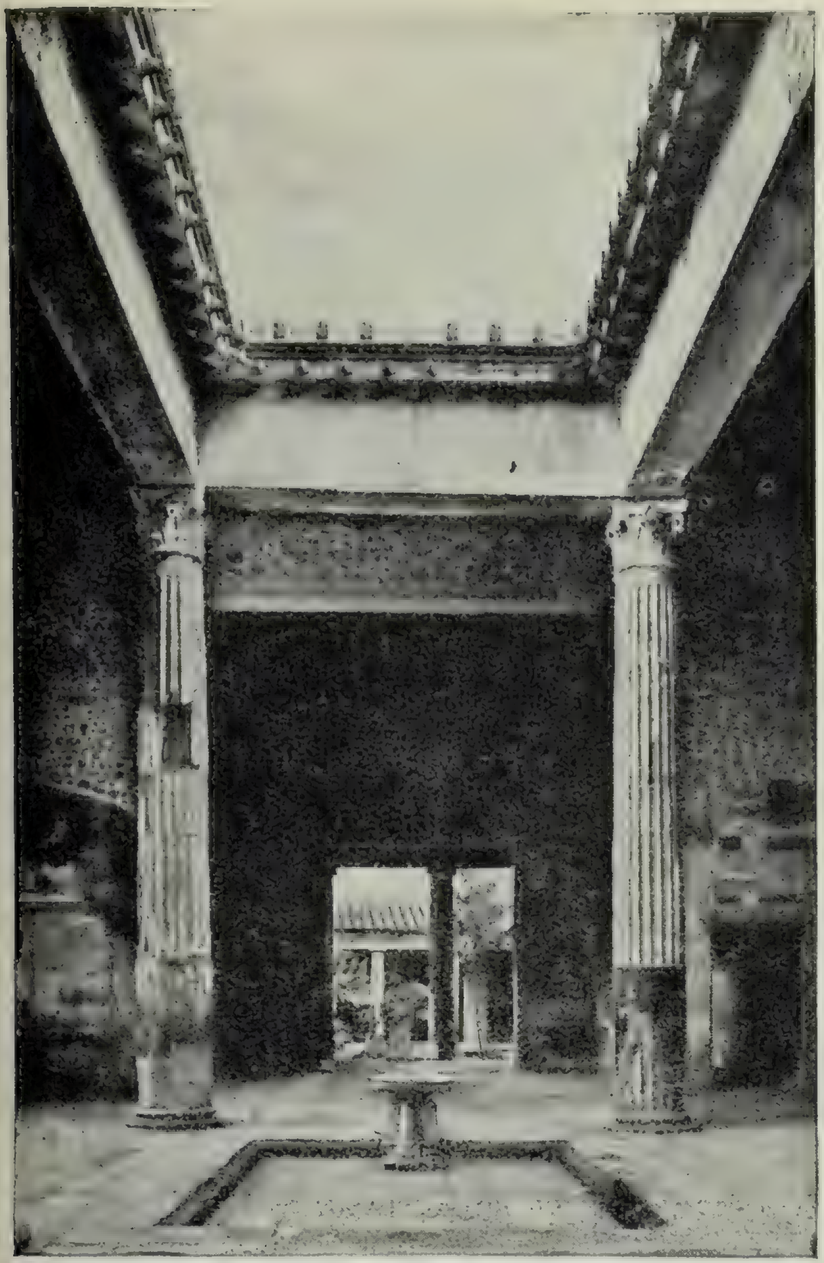


The Guildhalls of our older cities are precious relics of the past. Here is the famous Guildhall at Exeter.

IN EGYPT HOUSES WERE NOT ALWAYS ELABORATE.

Of course it was only rich people who could live in large houses and have beautiful furniture. Poor people still lived in one-roomed houses, and had very little furniture. But if

The fine Norman Castle at Chepstow, Monmouthshire, was built in the days of William the Conqueror.



The Romans built stately houses, with courts open to the blue Italian sky, and marble basins below to catch the rain.

you come to think about it, it is wonderful how people had learnt to build these brick houses and make beautiful things for use. For all this happened many thousands of years ago.

COME FOR A TOUR OF INSPECTION OF CHEPSTOW CASTLE.

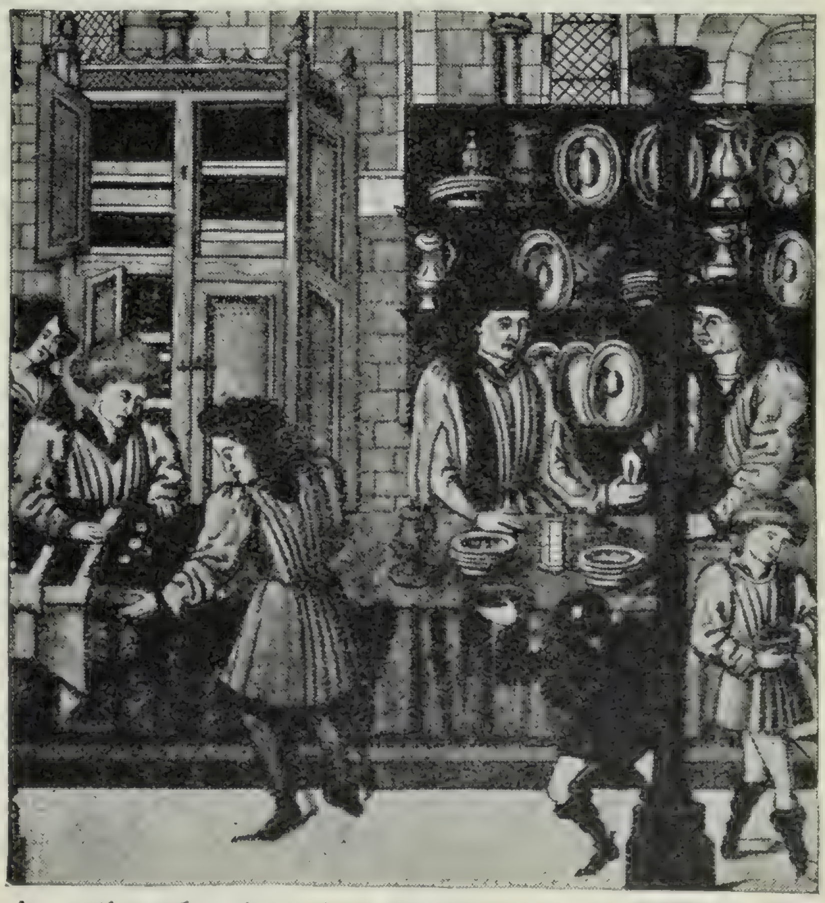
Let us go on a journey to Chepstow. To-day we should go by train or motor car, but if we are going there six hundred years ago, as we will imagine we are, we shall probably sail up the river Wye and land on the sloping ground just below the castle gates. Beyond this the steep cliffs tower above the river, and on the top stands the great stone castle we have come to see.

We cross a wooden bridge over the castle moat, and enter through a gatehouse. On either side of the gateway are rooms for the guards, and above is a room containing the windlass and the pulleys which work the drawbridge, and the portcullis, or iron gate, which can be lowered from above to close the entrance. The drawbridge is lowered ready for our arrival, but if we had come unexpectedly we might have found it drawn up against the entrance, so that there would be no way to cross the moat.

In the courtyard that we enter there are many buildings, stables for the horses, barracks for the soldiers who defend the castle, an armoury where weapons are stored, the smithy where the horses are shod and the weapons forged, large storerooms for food, and shelters for the cattle which must be driven into the courtyard if there is a raid from the Welsh over the border. Round the courtyard runs a high stone wall, thick enough for a pathway to run along the top of it to the turrets at its corners. In one of these turrets is the chapel where the lord of the castle, with his wife and family and servants, goes to hear Mass on Saints' days, and before the hunt or any warlike expedition.

HOW DID THE LORDS AND LADIES LIVE SIX HUNDRED YEARS AGO?

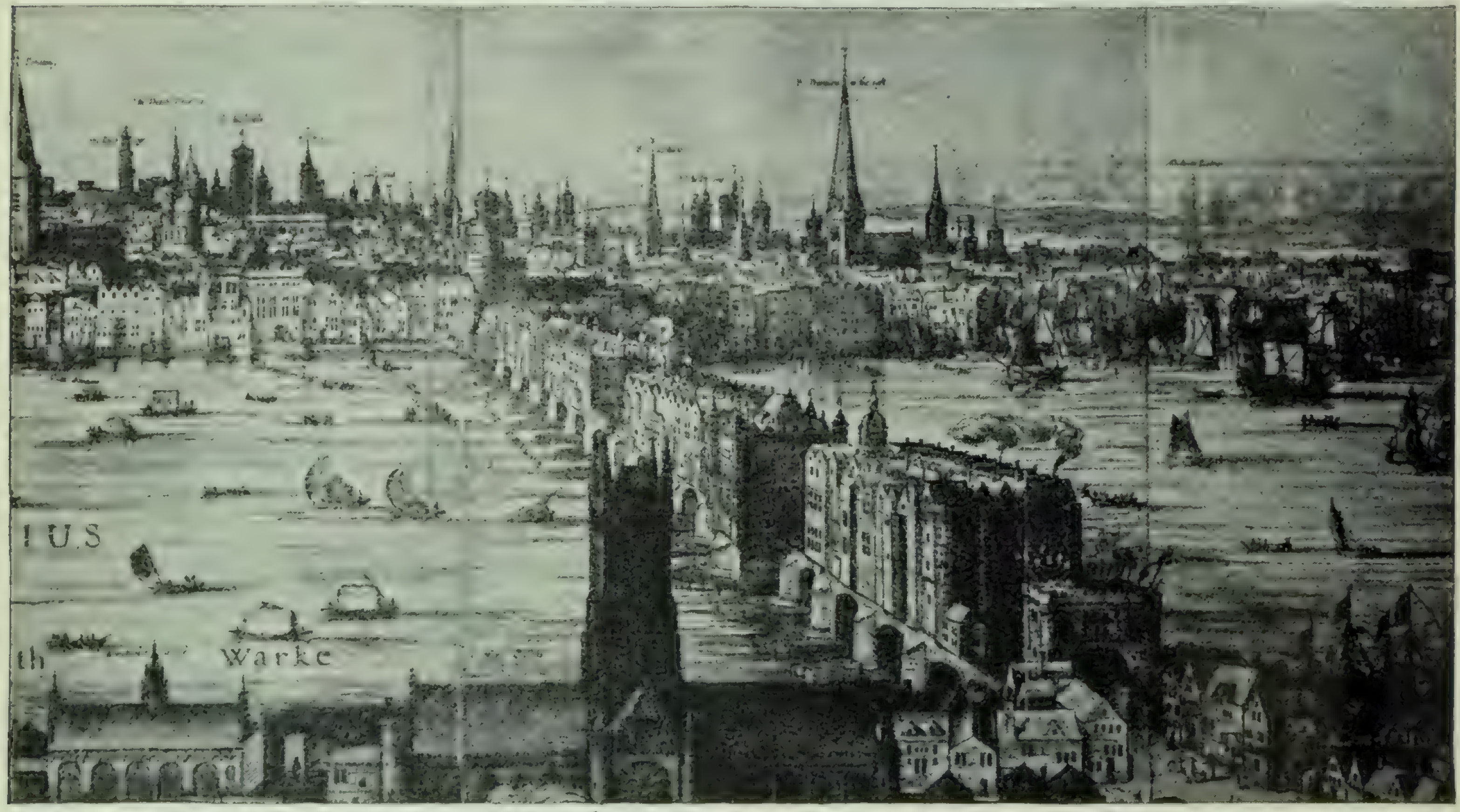
Through a doorway at the far end of the courtyard we pass into an inner one, surrounded by the same high walls. Here is the great kitchen where all the food for the people who dwell within the castle walls is cooked, and also the well, which must be carefully protected, for without water the defenders of the castle would be unable to withstand a siege. Then through an archway we enter a narrow flagged pathway. Over a low wall to our right we look sheer down into the river



An artist who lived four hundred years ago drew this picture, giving us a peep into a shop of his time.

hundreds of feet below. On our left is the keep, the strongest place in the castle.

This is where Lord Roger and his wife, Lady Eleanor, live. The first room we enter is the great hall, a long lofty room roofed with great oaken beams, blackened by the smoke from the log fire burning on the stone hearth in the middle. The walls are panelled with wood to about twice the height of a man ; above this they are pierced with unglazed windows which can be closed with stout wooden shutters. The floor is spread with rushes, and down the length of the room run wooden trestle tables and benches. They are laid ready for a meal, but there is little on them but pewter tankards, for in these days people used thick slices of bread for plates and their own knives to cut their meat.



A picture of London Bridge in olden days, with Southwark in the foreground and the Tower on the extreme right.

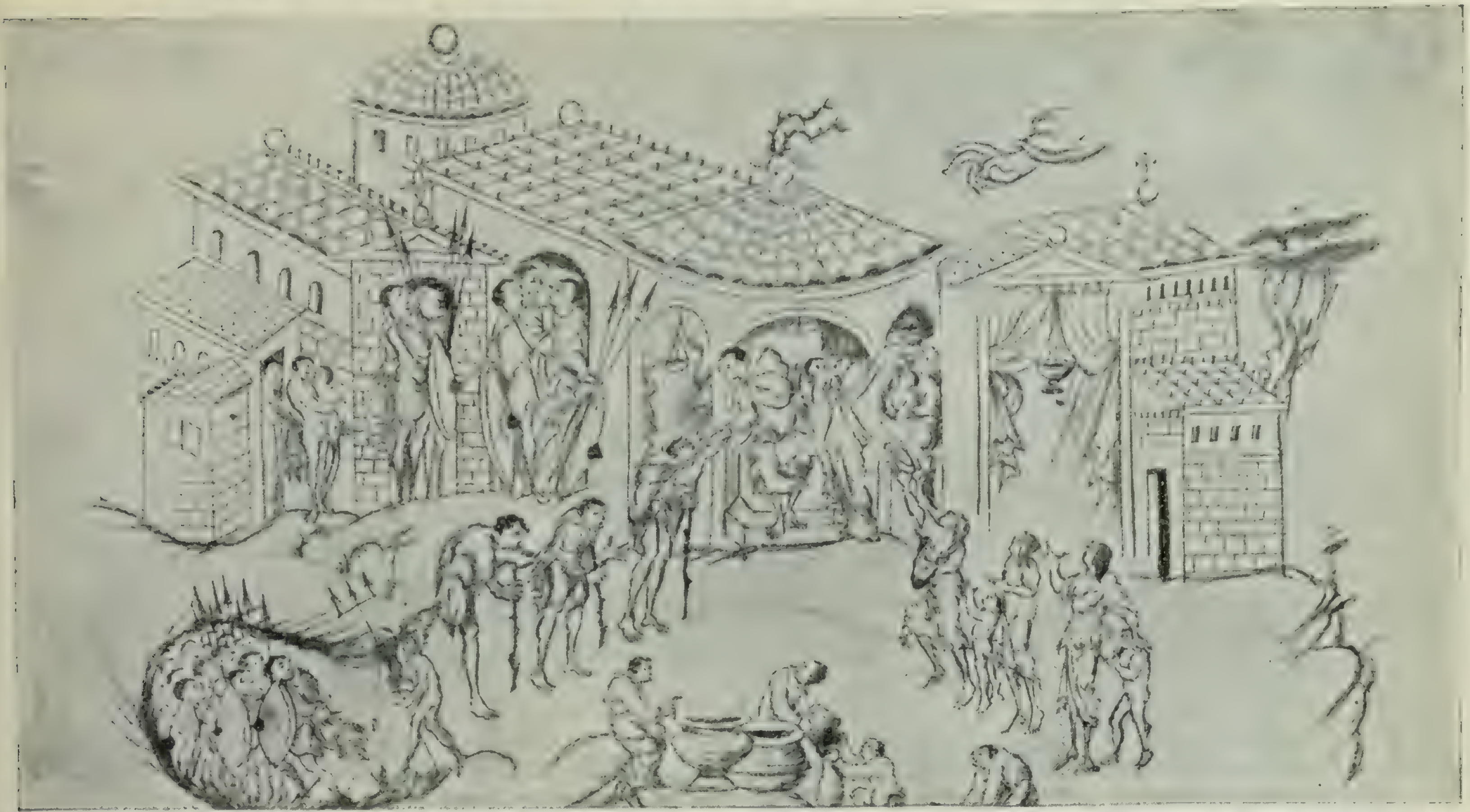
At the far end of the hall we can see a raised platform with a carved wooden table and chairs. On the table stand tall glass goblets, flagons full of red Bordeaux wine, and a great silver saltcellar. Here Lord Roger and his family and honoured guests take their meals, while in the hall below sit the retainers and guests of lesser quality. Behind the big carved chair in which Lord Roger sits is a beautiful piece of silken tapestry bearing his coat-of-arms. It has been woven by the Lady Eleanor and her maidens during the long days while her lord has been away fighting in the king's service.

A small door in the wall behind the dais leads us into the solar, which is the sitting-room and bedroom of Lord Roger and his wife. Through a window in the thick wall we can look out over the town below the castle. Before the wide fireplace in one wall is a beautiful rug, brought back from the East by a Crusader. The walls are painted a soft blue powdered with gold stars. To us there seems very little furniture, only a bed with a silken coverlet, a few chairs, and two large oak chests with iron locks, in which are kept clothes and jewels and all the parchment scrolls and account books relating to the estate. Up a winding stairway from this room we can go to other little rooms built in the stout walls of the keep, in which the children and the Lady Eleanor's waiting women sleep. They are dark and cold, very uncomfortable bedrooms, we think.

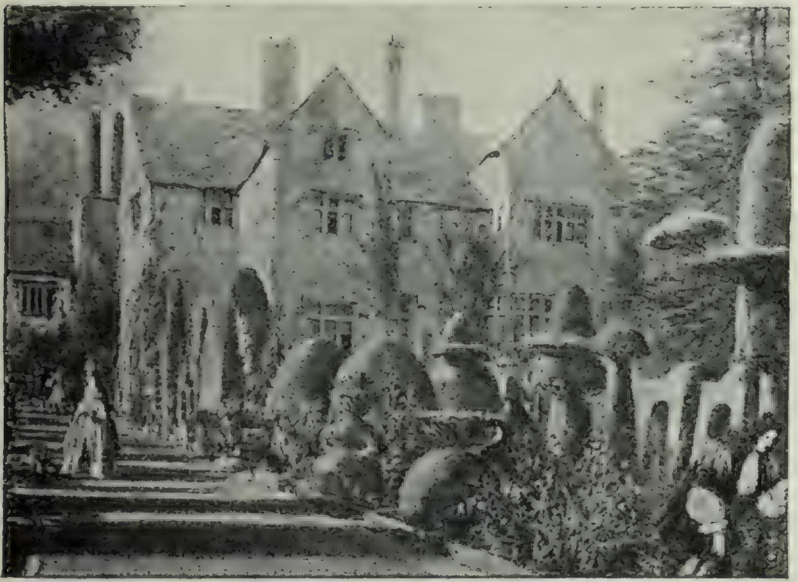
Then we go back through the hall to the little flagged pathway over the river, and following this we come to a small garden, where the Lady Eleanor sits in summer time and walks with her lord in the evening, and then to the back entrance to the castle. This is a stout wooden gate flanked by tall towers. Through a little postern gate we leave the castle, and return to the main gateway by a path beside the moat, which runs round below the castle walls.

Why does the Lord of Chepstow live in a home so stoutly defended, do you ask ? Because the times are warlike, especially on

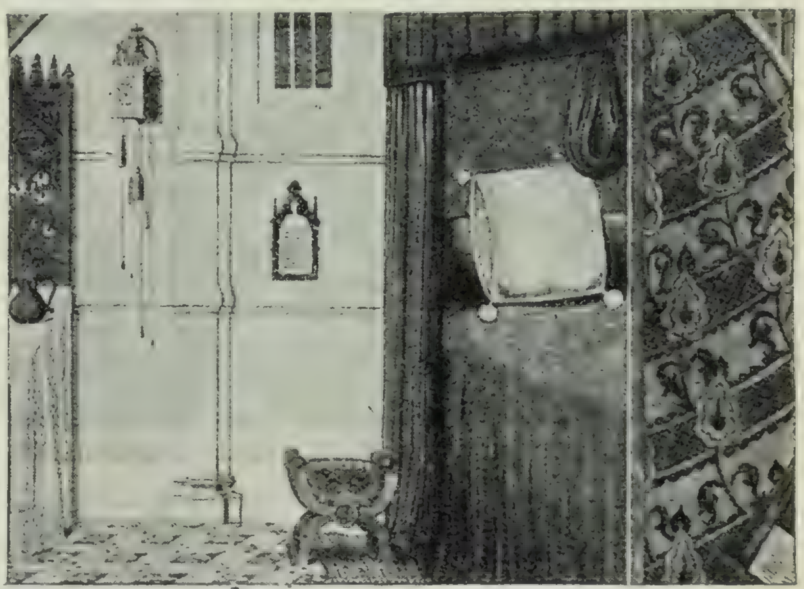
ARTISTS OF LONG AGO DREW THESE PICTURES



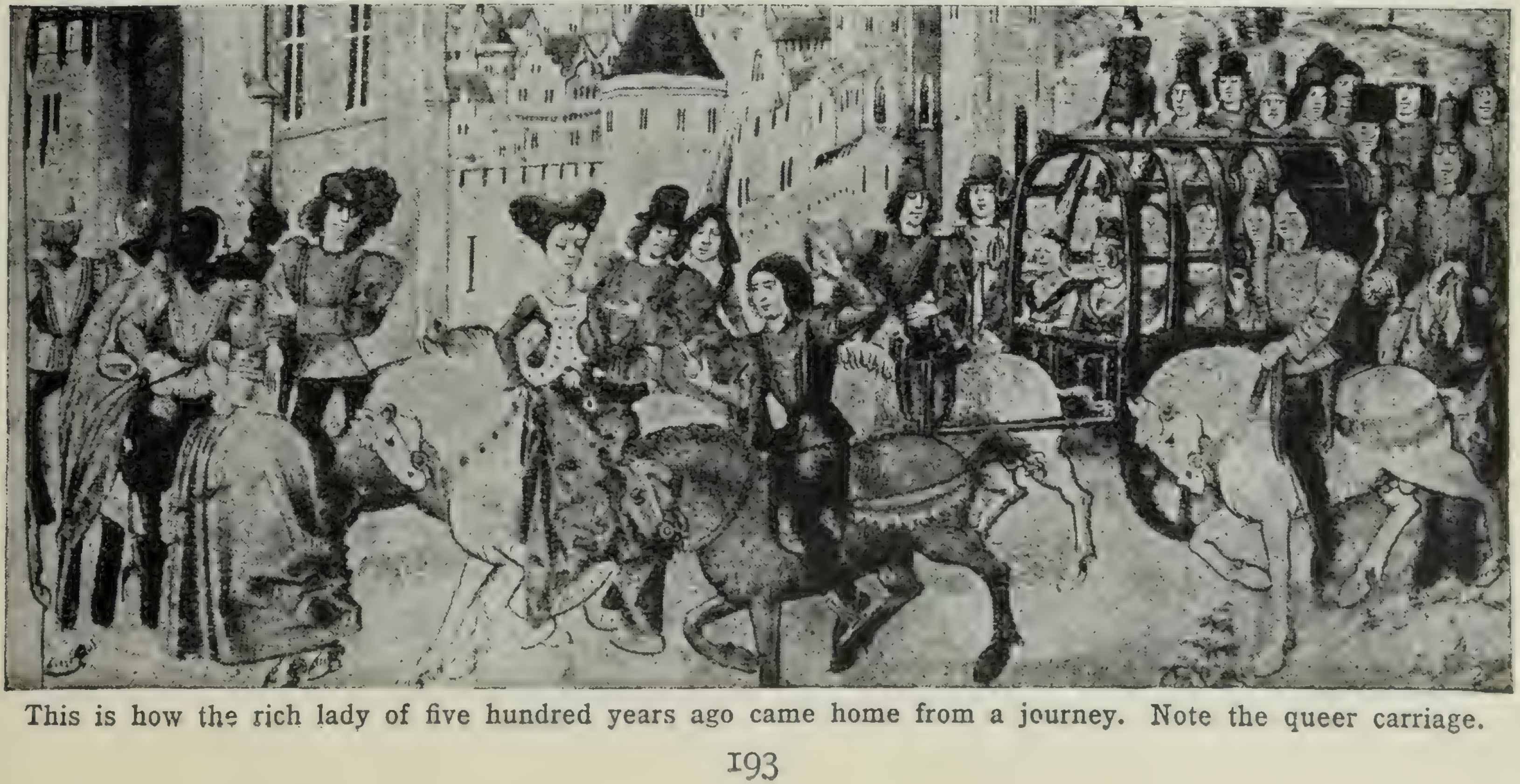
From a very old document comes this drawing of Anglo-Saxon buildings, such as were in England a thousand years ago.



Fine gardens and homes of three hundred years ago.

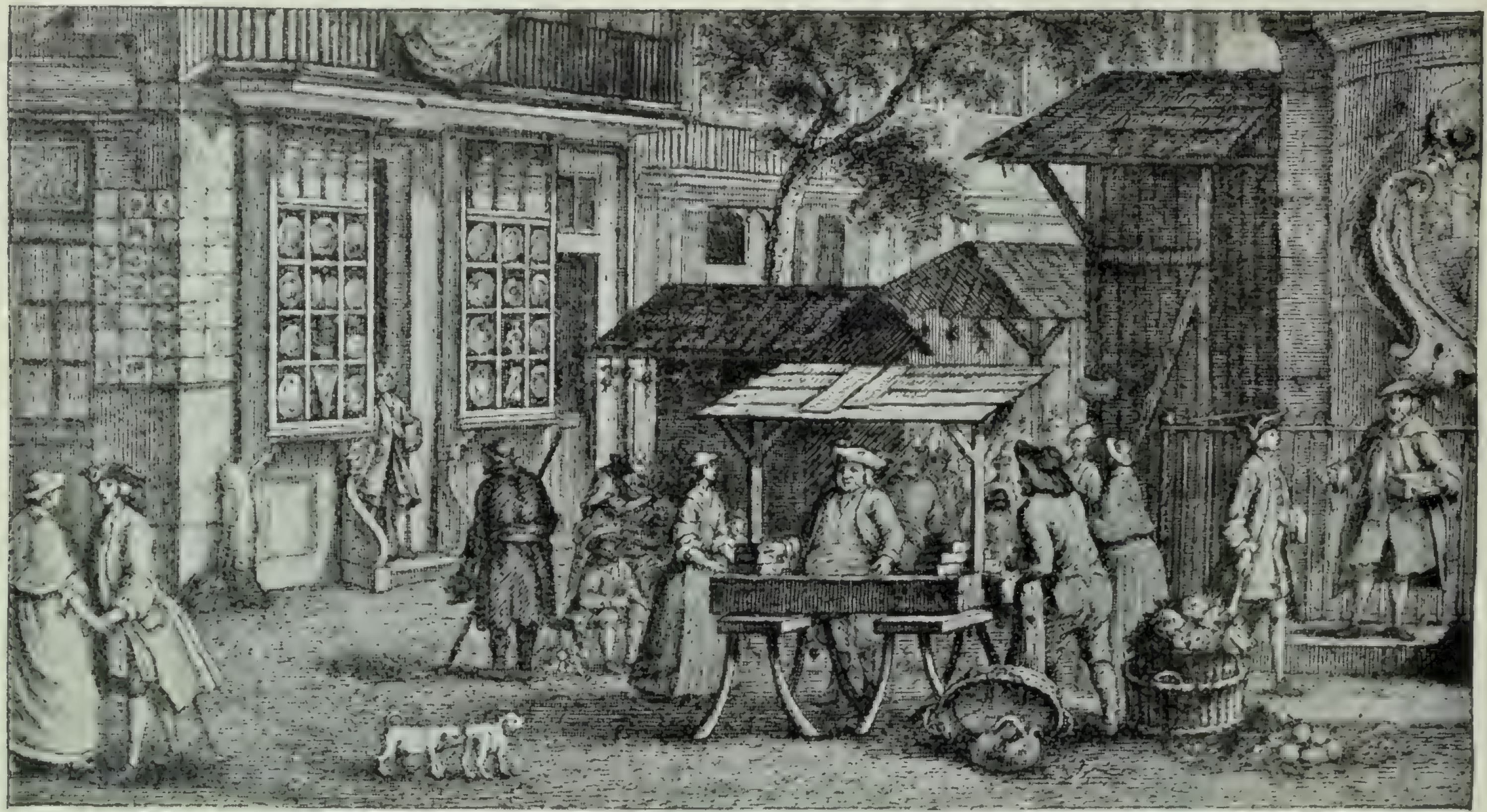


The bedroom of a house of five hundred years ago.

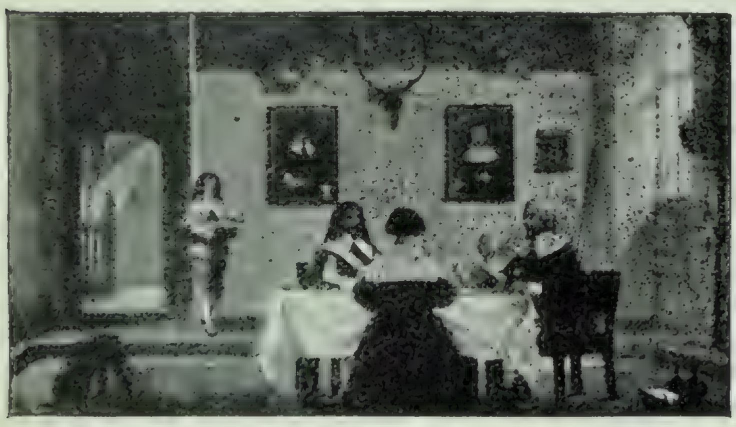


This is how the rich lady of five hundred years ago came home from a journey. Note the queer carriage.

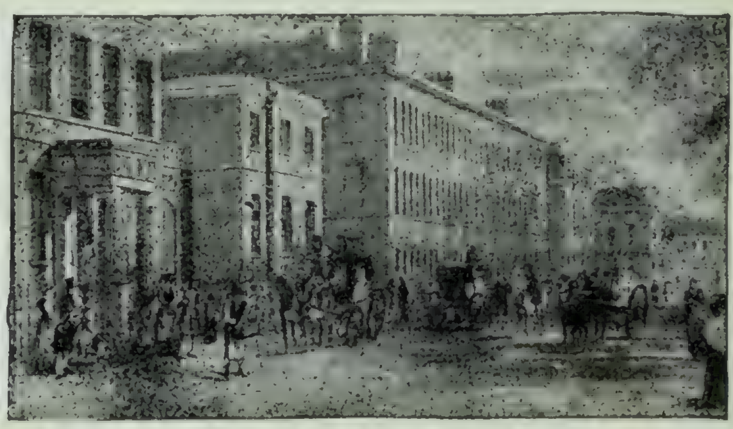
MORE HOMES OF DAYS GONE BY



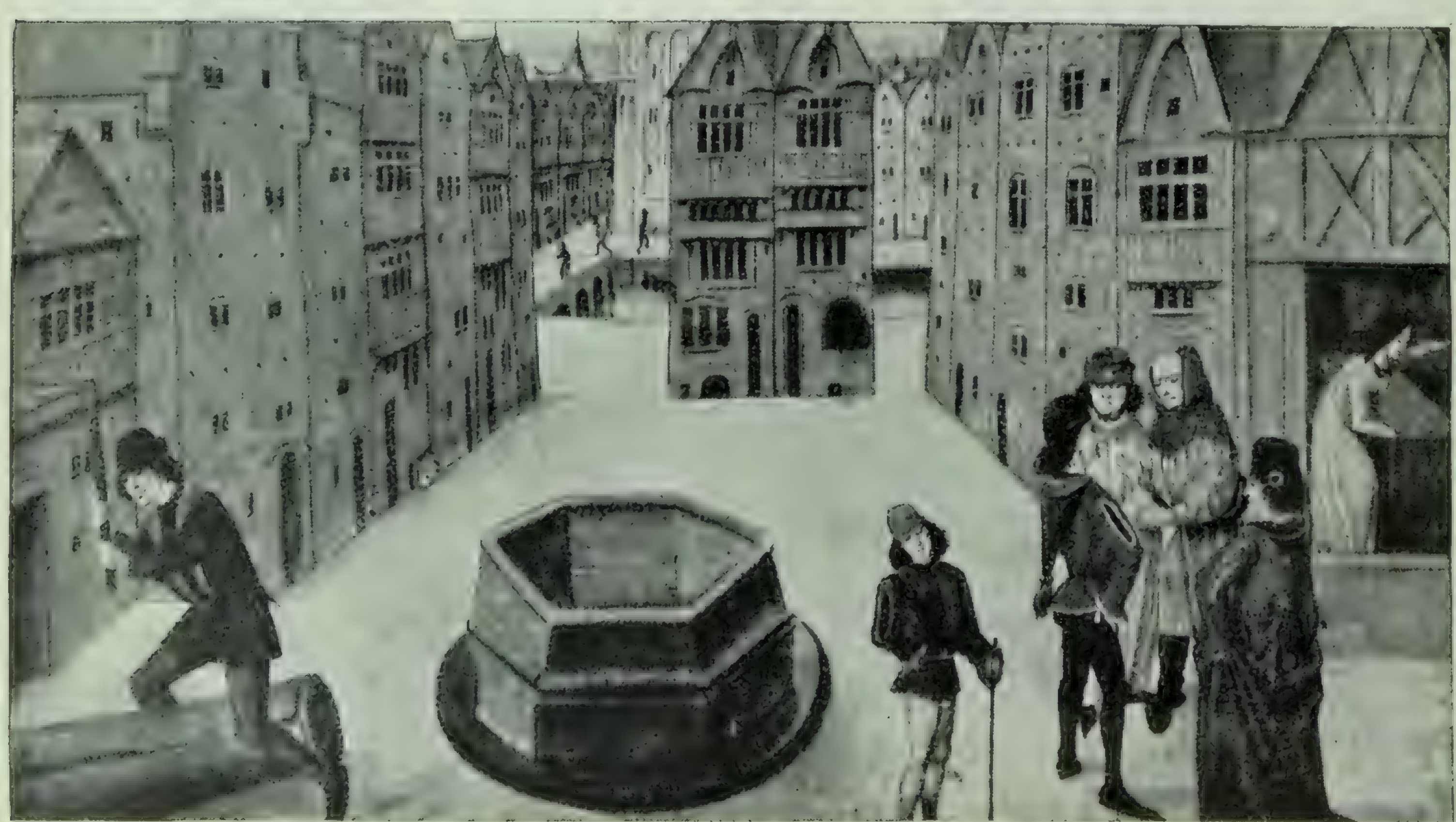
Outside an eighteenth century house in London. The bookseller is showing his books to customers.



A Puritan family of Cromwell's time at dinner.

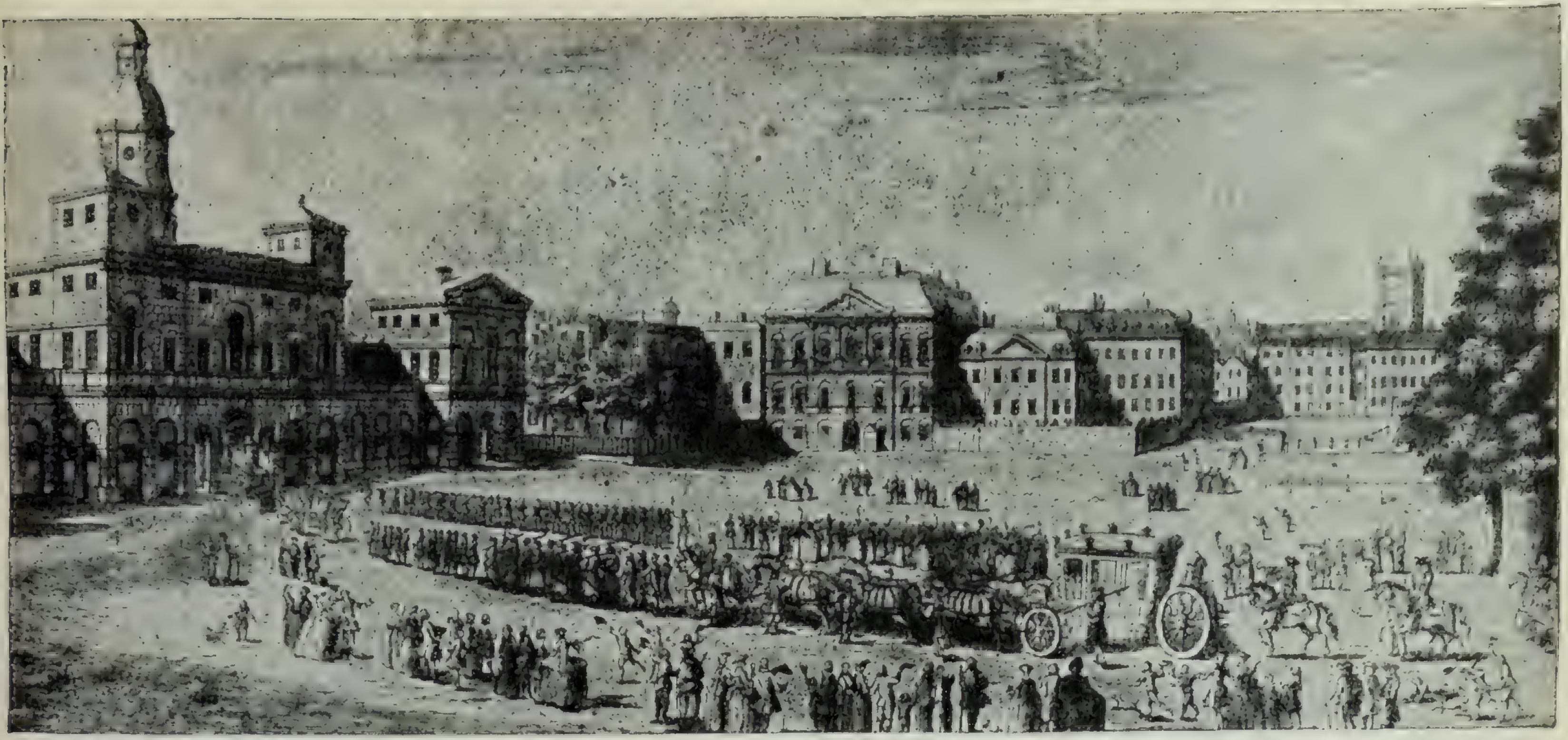


A street in Liverpool about a hundred years ago.



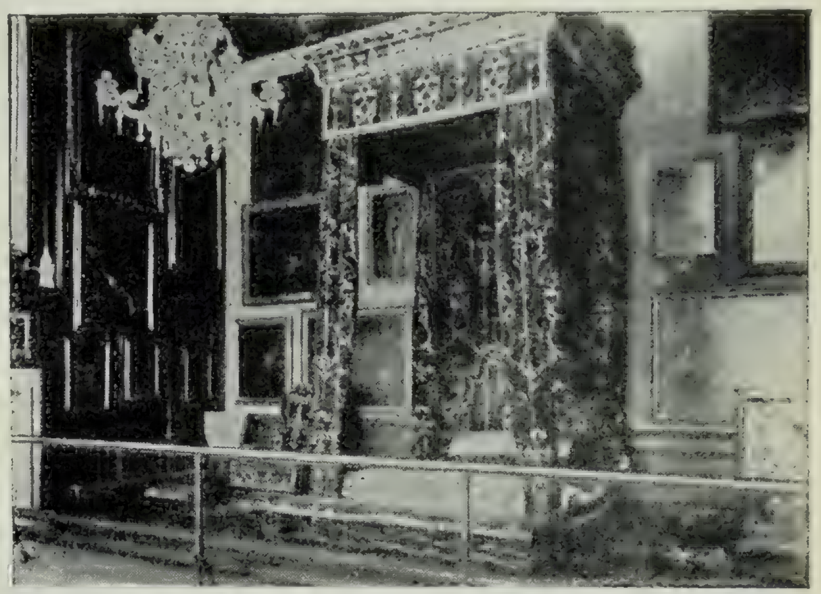
When Caxton went to Bruges to learn the art of printing this is the kind of town he saw.

HOUSES FROM TUDOR TIMES TO OUR OWN DAY



King George II. goes to the House of Lords. A fine picture of life and architecture of the eighteenth century.

Hampton Court Palace on the Thames, is a marvel of brick and stonework. It was built by Cardinal Wolsey, and presented by him to Henry VIII. The part of the palace shown, which is of later date, was added by William III.

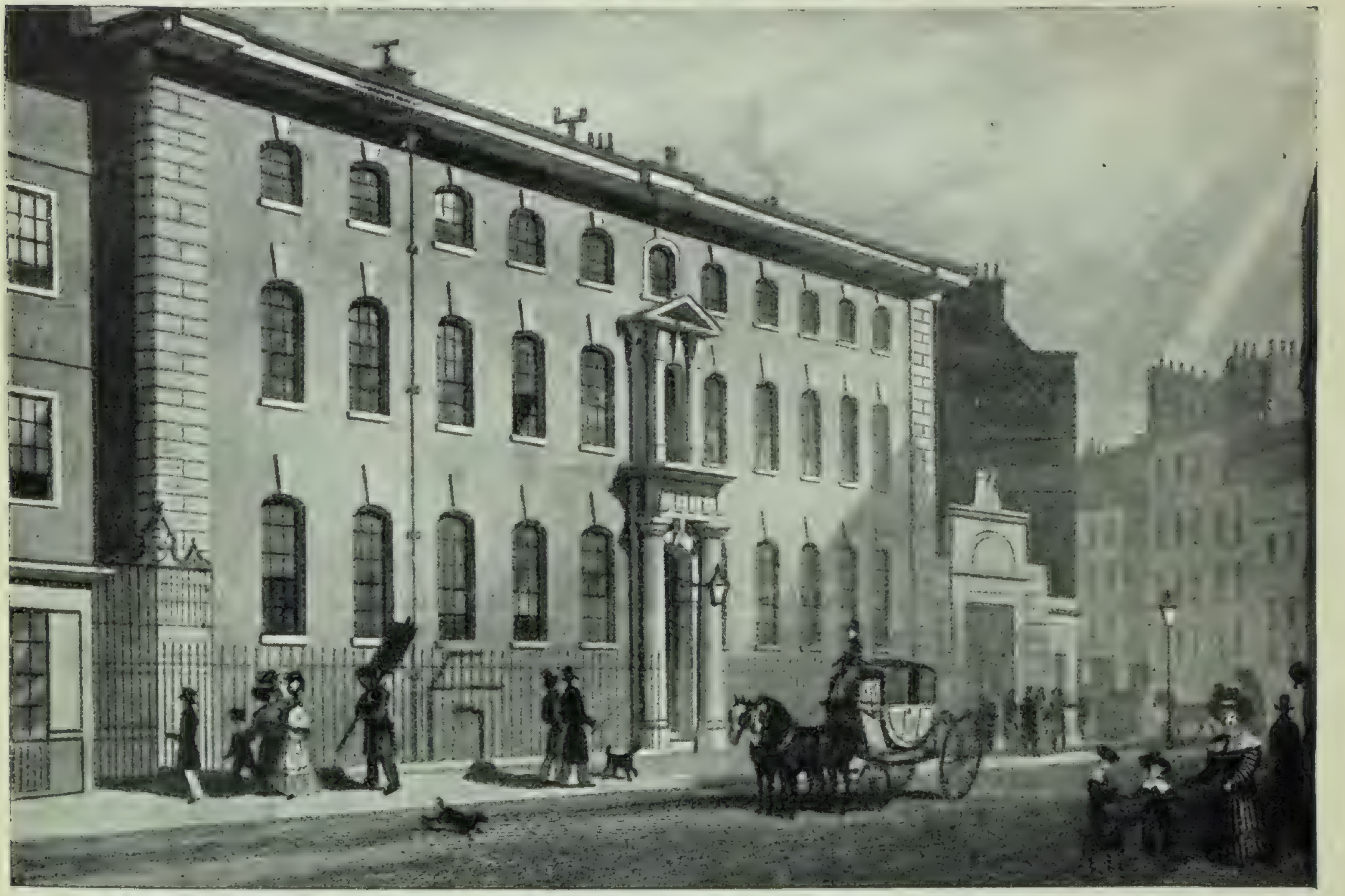


Here is Queen Anne's bedroom in Hampton Court Palace. Note the canopied bed with its rich curtains. People did not realise the benefits of fresh air in their bedrooms in Queen Anne's day. The curtains were drawn at night.

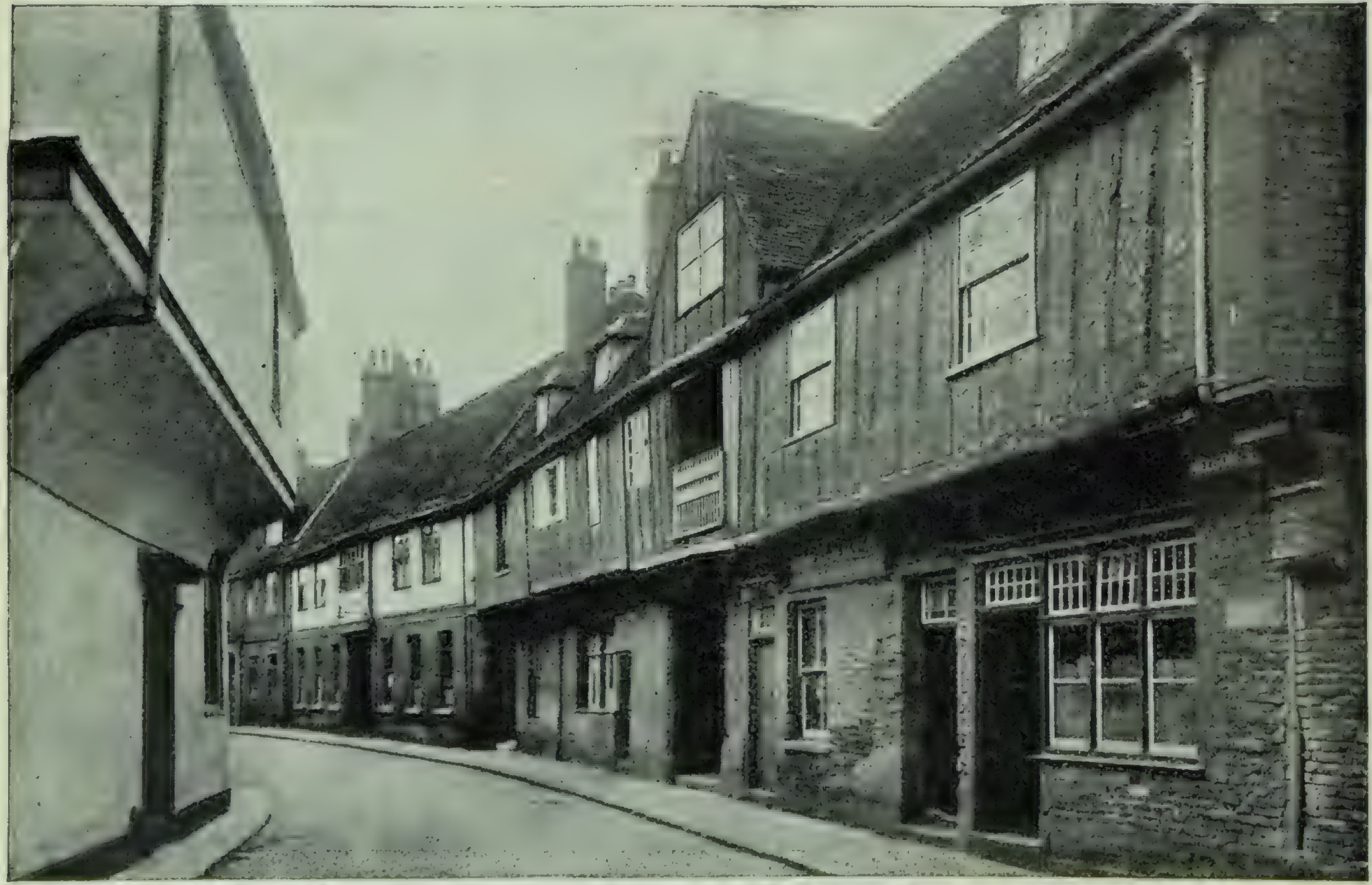
Modern houses are well planned and are built for comfort, labour-saving and for general health. Here is an estate laid out for workers in a great cocoa and chocolate factory. Note that the old-fashioned streets of dull-looking houses are no more, but in their place are houses with gardens and trees to give freshness and beauty. [*Cadburys*

WELL-BUILT HOUSES OF THE RICH AND POOR

With a glimpse at Costume and a Carriage



In Threadneedle Street, London, once stood the famous South Sea House. This house reminds us of a terrible gamble in stocks and shares that took place here early in the eighteenth century, almost ruining the country. The affair was known as the "South Sea Bubble."



In Nelson Street, King's Lynn, Norfolk, these old houses, with their overhanging gables and picturesque timber work may still be seen. In very narrow streets the inhabitants could open the bedroom windows and shake hands with their opposite neighbours.

the Welsh border, for the Welsh hate the English. Other men may live in manor houses, more like the country houses of our own day, or in little timber and plaster houses, but a great baron who has to defend the land must live in a large stone castle, where he can have many soldiers, and where the people of the neighbourhood may shelter from their enemies.

OUR VILLAGES SPEAK OF ANCIENT GLORY

STRANGERS who come to our village exclaim with delight at its quaint old-world air. They are amazed at its broad, steep street leading up to the market square. Our village has a square instead of a green, because five hundred years ago it was quite a prosperous little town, making woollen cloth which was famous all over England. But when the railway was built, it passed by to the south instead of going through the town, and the big factories, where cloth is now woven on machines instead of on the hand loom, were built along its route. So our trade decayed, and now we are only a sleepy country village.

DO YOU EVER EXAMINE THE BEAUTIES OF OLD HOUSES?

But in the days of its prosperity many rich people lived in the village, and their houses still stand on either side of the street and around the square. By the bridge which spans the river at the bottom of the street is a long low house, which was the home of a well-to-do merchant in the fifteenth century. It is built of timber and plaster, and the long oaken beam which supports its projecting upper storey is finely carved with bunches of flowers and fruit. The fifteenth century wood carver loved his work, and many hours of patient labour in the warm sunshine must have gone into the carving of that beam. Its thatched roof has quaint over-hanging eaves in which are set low diamond-paned casement windows, and its old red brick chimneys make a glowing spot of colour among the soft brown, grey and white of the walls.

Its stout oak door opens into a stone-flagged hall with a ceiling crossed with great wooden beams, nearly black with age. The living-rooms which open out of it have similar beams, and huge open fireplaces and ingle nooks. Beyond the hall is a big, airy kitchen where, in olden times, the merchant's wife superintended her maids as they made the pickles and preserves, and dried the herbs that grew in plenty in the well-tended garden, and washed and ironed the snowy linen that she had woven on her own loom in the long winter evenings.

If we went upstairs, we should find passages with polished boards, and steps in unexpected places, and bedrooms leading out of one another. For the old house builders did not plan their houses as modern architects do; they had plenty of space in which to build and they added rooms as they wanted them, of all shapes and sizes, and at any level. So an old house is full of surprises for us.

WHY DID HOUSES BEGIN TO HAVE LARGER WINDOWS?

There is another house that all visitors to the village stop to admire. It is the Hall where the squire lives. It stands in large grounds, enclosed by a high brick wall. It has been the home of the family ever since the days of Queen Elizabeth, when it was built. A broad flight of stone steps leads up to the terrace on which it stands, and on either side of the steps below the stone balustrade are yew trees cut into all sorts of strange shapes. In Elizabeth's time people loved to have quaint formal gardens, carefully laid out with shrubs and lawns and flower-beds, and the squires have kept the garden the same ever since.

The Hall is built of mellow red brick, but, except for the gables and quaintly shaped chimneys, we can see very little of it. For it is full of windows, tall ones full of little leaded panes covering the whole front of the house. An old man in Elizabeth's day grumbled about these "fair houses so full of glass, that one cannot tell where to be come, to be out of the cold." But in those times they had not any central heating. The squire has had this put into his house, so that he can enjoy the light and fresh air without feeling the cold.

WHEN DID WINDOWS THAT OPENED TOP AND BOTTOM FIRST COME INTO FASHION?

Standing in the square is another fine old house in which our doctor lives. It is not so large as the Hall, but it is solid and comfortable looking. Behind its iron railings and finely wrought gateway, its stone front, with its green painted door in the middle, and straight rows of tall narrow windows, looks dignified but rather severe. The windows are no longer casements; they are the sash windows which are familiar to us, for these had just come into fashion when the house was built in the reign of George I. Below the ground-floor we can see a basement, for these too began about the same time, when servants were no longer treated as members of the family as in older days, but lived apart in their own special quarters in the house.

VILLAGE HOMES THAT TELL THE STORY OF FOUR HUNDRED YEARS.

This house was built by a man who had made a fortune trading in India. He wanted a beautiful home in which to live with his large family, and as he had plenty of money to spend on it, he decorated it finely both inside and out. Visitors always admire the finely carved pediment over the doorway and the cornice that runs under the tiled roof. The panelled walls of the rooms are painted in delicate colours, and the plastered ceilings are decorated with moulded designs of fruit and flowers. From the big square hall a staircase with shallow polished mahogany stairs leads up to a wide landing from which the bedrooms open off. It is a roomy and comfortable house, and far more conveniently arranged than the older ones down the street.

These are the three biggest and oldest houses in our village, but there are many others, little brick built cottages whose doors open straight into the living-room, with narrow little stairways leading to two bedrooms above, Victorian villas with bay windows and slate roofs, and several little modern houses built of cement and stucco, which imitate the old fifteenth century house, with their casement windows and thatched roofs. There are shops too, some with large plate glass windows, built during the last fifty years; others which have low bow-shaped windows with bottle glass in their panes, and steps leading down from the doorway into the shop. In some of these shops the same family has carried on business for two hundred years. If we were to go into all the houses in the village and then compare them one with another, we should be able to find out what sort of homes people have lived in for the last four hundred years.

HOW OUR ANCESTORS FURNISHED THEIR HOUSES LONG AGO.

We should even be able to see what sort of furniture they used, for many of the people in the village still have furniture that was made in the days when these houses were built, polished mahogany tables and " tallboys " (as chests of drawers were then called) of Georgian times, oak chests and coffers of the sixteenth century, copper bed-warmers belonging to the days when there were no hot water bottles, and pewter plates and jugs, and even woollen antimacassars and waxed fruit under glass shades such as the Victorians loved, and which we think rather ugly nowadays. We should find out how much time and thought people have put into improving their houses and their ways of living, and perhaps we might even think that in some ways, such as building solidly and making their furniture beautiful as well as useful, the people of older times did better than we do.

KEEPING THE DOCTOR AWAY IN OLDEN DAYS

JUST over a hundred years ago two men were born whose work has done wonders for human beings. One was a French scientist called Louis Pasteur, and the other was an English doctor, Joseph Lister. Through the discoveries of these two men, and of others who worked after them, doctors are able to cure us of diseases, to prevent wounds from being poisoned by dirt, and to make operations painless by the use of chloroform. Before the time of these men, illness and operations were terrible experiences, but now they are not nearly so much to be feared. Among all the wonderful things in our lives, the work of the great doctors has given us most to be grateful for.

Louis Pasteur.

In very early days there were no doctors. If people were ill, they went to the priest to be cured, because they thought that the gods had sent the illness as a punishment for some evil they had done. The priest would give them a medicine made of herbs, or if it was an earache, for example, he would pour warm olive oil into the ear, but more important than this, he would murmur a magic charm, which was believed to relieve the sufferer. For a tooth-ache, which was thought to be a worm in the tooth, the priest would say " O Worm, may Ea smite thee with the might of his fist."

As time went on people learned more about the healing properties of herbs and plants, and they also found out about the bones and the organs of the body. Among the Greeks and the Arabs there were clever doctors, who were no longer priests, and in the twelfth century an Arab doctor, called Averroes, wrote a big book all about medicine. But still, though people knew more about how to cure illness, they did not know how to prevent it, and people died in thousands from epidemics of plague and typhus fever. If you have read about the Great Plague in London, you will realise how little people knew about how to prevent illness even as late as the seventeenth century.

Lord Lister.

DO YOU KNOW WHY AND HOW MILK BECOMES SOUR ?

It was Louis Pasteur who found out the cause of disease, and so helped the doctors to find means to prevent it. He discovered that milk went sour, if kept for any length of time, because of the action on it of tiny living things which he called bacteria. He also found out that these bacteria could not live in more than a certain degree of heat, and that if the milk were heated up to a certain temperature it would go sour much less quickly. That is why we call milk treated in this way " pasteurised milk."

Then he went on to study the diseases of silkworms, chickens, dogs, cattle and sheep, and found that in each case the disease or " going bad " in the animal was caused by living organisms similar to those in the milk. Better still, he found out how to protect the animals from the disease by inoculation, that is, by putting into the blood certain substances obtained from the dead bacteria of the disease. He was able in this way to save dogs from rabies, the disease which makes them mad, and to lessen the disease called anthrax among cattle.

MAKING THE WORLD HEALTHIER. EXPERIMENTS ON THE HUMAN MACHINE.

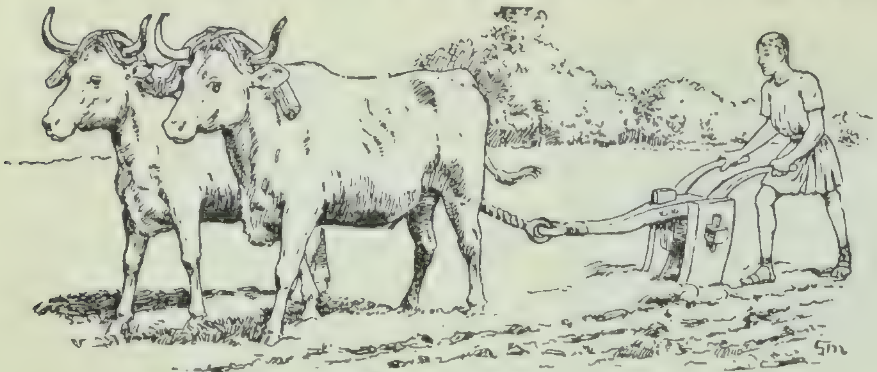
The knowledge that Pasteur obtained from animals was then applied to human beings, and now many of the worst diseases from which people used to suffer have been nearly stamped out. Cholera and typhus fever are now almost unknown in England. Smallpox has been greatly lessened by means of vaccination, which is a form of inoculation discovered by Dr. Jenner about thirty years before Pasteur was born. Now doctors are trying to stop colds and influenza by means of inoculation. Much of what Pasteur did only doctors can understand, but one part of his teaching everybody can understand, and by carrying it out they can help to prevent disease. He showed that the bacteria of diseases throve in dirt, and that the less dirt there was the less bacteria there would be to cause disease. So, by keeping our bodies, our homes, our streets and public places clean, we can all help to prevent illness and aid the doctors in the work they are doing to cure illness and drive away pain.

While Pasteur was working in France, Joseph Lister was studying another problem in England. Besides dying from disease, many people before Lister's time died after an operation, such as the cutting off of a leg, because the wound became poisoned or septic. Lister came to the conclusion that this was due to bacteria which were carried by the air (which is always full of bacteria) or the surgeon's instrument. After many experiments, he found out how to apply to the skin round the wound and to all the instruments, utensils and dressings used in an operation substances in which bacteria cannot live. Nowadays no operation, however slight, is performed without the use of such substances, which are called antiseptics or disinfectants, and we often use an antiseptic like iodine ourselves for a bad cut.

THE MEN WHO TOIL TO KEEP OUR BODIES HEALTHY.

Since the days of Pasteur and Lister, other men have made discoveries which have been equally wonderful in preventing illness and pain. An Edinburgh doctor, James Simpson, began to use chloroform to put people to sleep while undergoing an operation. Sir Ronald Ross, who only died in 1932, and of whom you will read elsewhere in this book, proved that the bacteria of malaria were carried to the human blood by the bite of the mosquito, and now by stamping out the mosquito, many places have been entirely freed from malaria. To-day doctors are experimenting with radium as a cure for cancer. Many people know very little about this; but in keeping the human body healthy, doctors are doing wonderful work.

HOW DID FARMERS WORK IN DAYS GONE BY?



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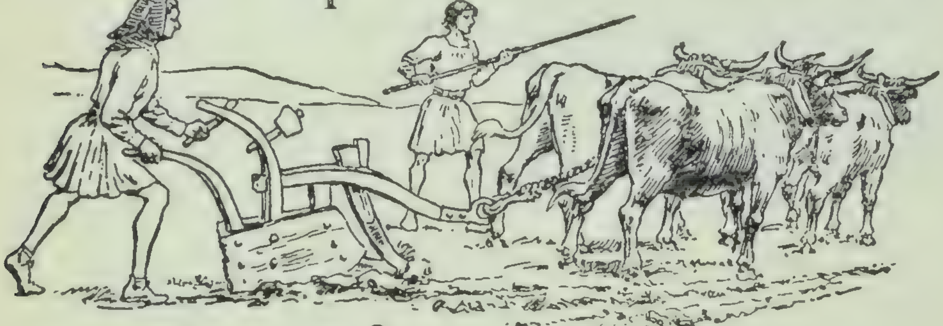

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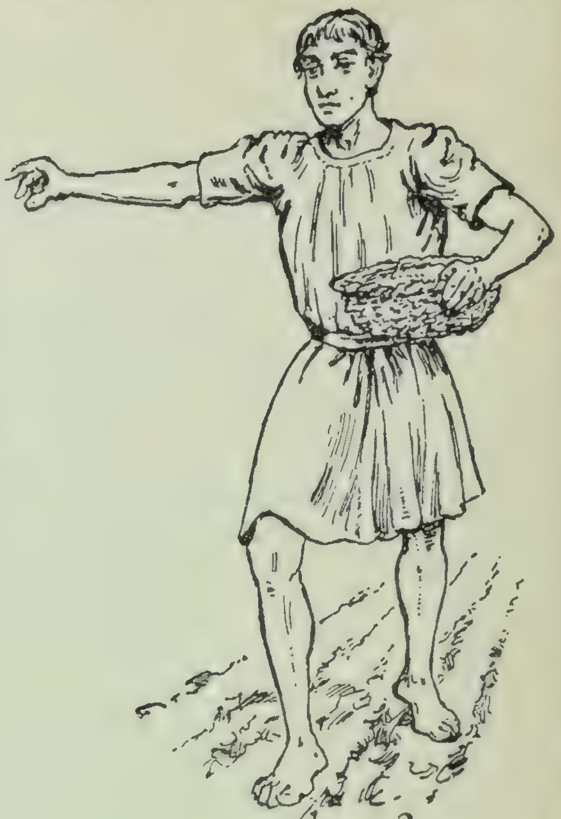

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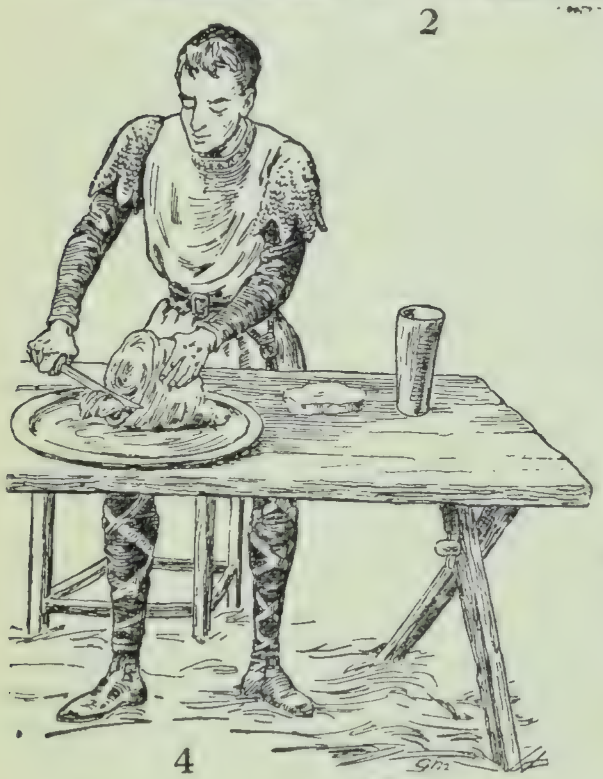

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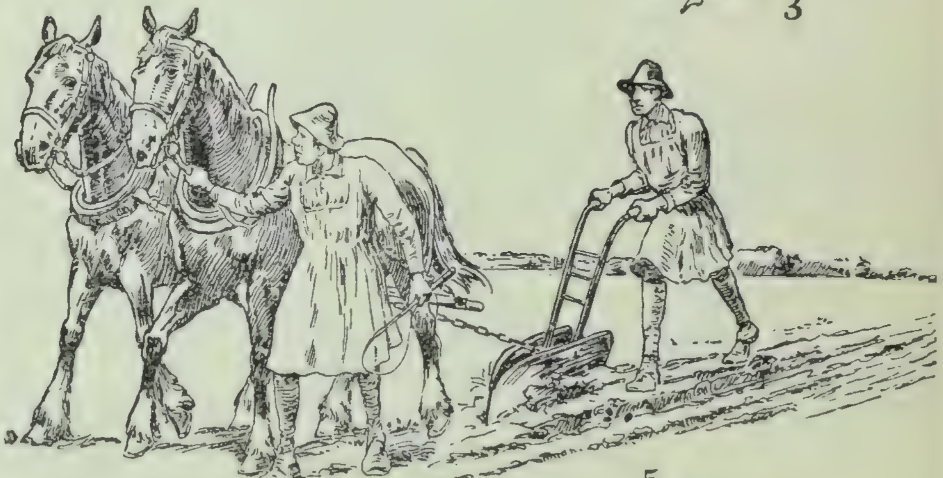

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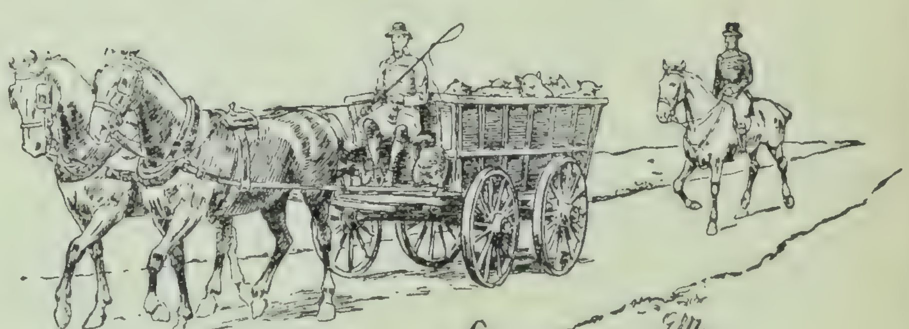

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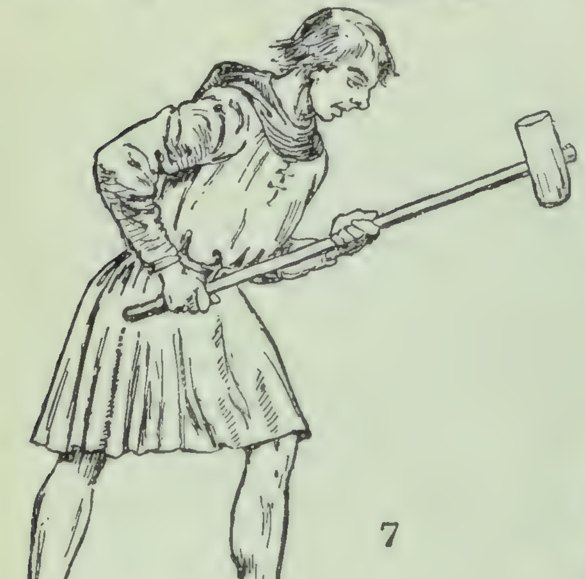

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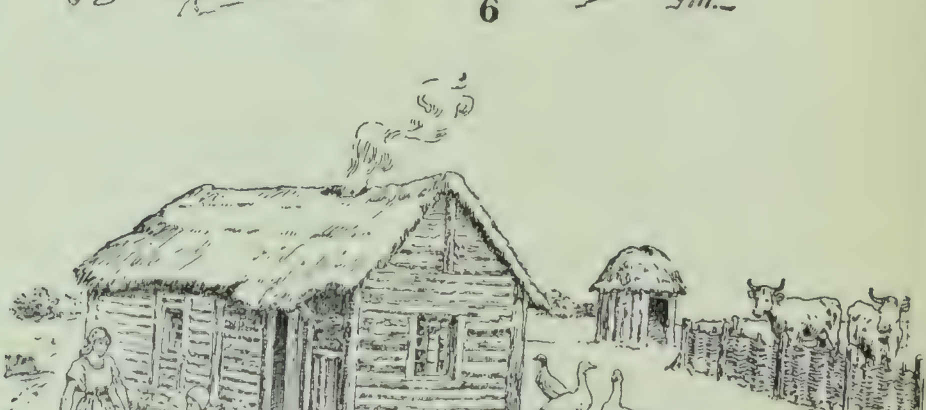

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1. Ploughing in Roman times. 2. A Saxon ploughing. 3. Saxon sowing seed. 4. Norman carving a joint. 5. Ploughing 200 years ago. 6. Going to market 100 years ago. 7. A serf of Saxon times at work. 8. A Saxon farm.

MAKING MACHINERY DO OUR WORK

HAVE you ever thought of counting up the number of machines you see in a day? The automatic machine which produces tickets at the Underground railway, the pneumatic drill that roadmenders use, the sewing machine with which your mother makes your clothes are only three of the many machines in use every day. And how many machines are there working day and night that you don't see? A machine has printed this book, a machine has woven the material for your clothes, a machine has made the ice cream you love to eat in summer. Most of the work of the world to-day is done by machinery, driven by water or steam power, gas or electricity. This method of getting the work of the world done became general less than two hundred years ago. It has made such a difference in our lives that it is called a revolution, which means a complete change.

IN THE DAYS BEFORE THE MECHANICAL AGE, LABOUR WAS VERY SLOW AND DIFFICULT.

Before this time work was done mainly by hand with only very simple tools and appliances. The plough was driven by horses and guided by the man who walked behind it. Hay was cut with a scythe and corn with a sickle. Women spun woollen yarn and cotton thread on wooden spinning wheels, and weavers threw the shuttle of their simple looms by hand. The potter moulded cups and bowls with his thumb, and the furniture maker turned the legs of tables and chairs and put them together by hand. Roads were made and mended by men working with pickaxes and shovels, and steam rollers did not exist; ships were built of wood by men using hammers and saws, rivets and nails. Heavy and complicated machinery would have been useless even if it had been made, for men cannot work heavy machines. But the discovery that steam and electricity could be used to drive machines entirely altered methods of work, and a marvellous change has taken place in our everyday lives.

WHY DO WE WORK IN CROWDS AND NOT IN OUR OWN HOMES?

To-day very few people do their daily work at home. Most of them go to factories, offices or shops all day, and only come home in the evening when their work is done. Before the Industrial Revolution many more people did their work in their own homes. Some of them were their own masters; others worked for employers, but they did not go to a factory and work together; they carried out their orders in their own homes and handed over their work to their employer when it was finished.

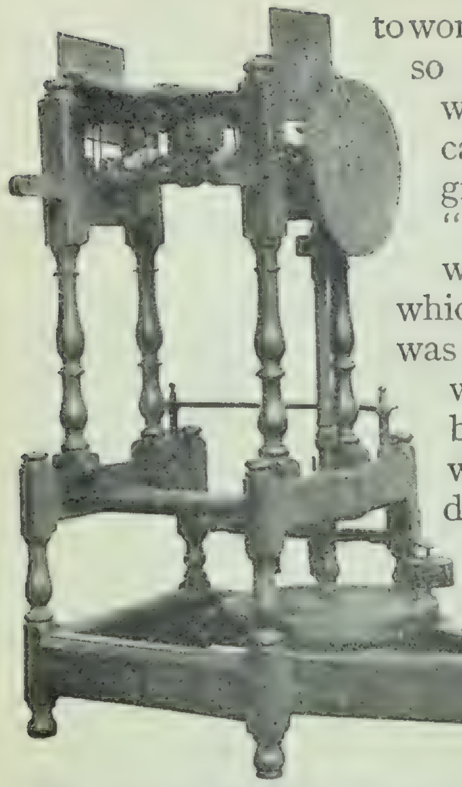
HOW DIFFERENT CRAFTSMEN WORKED UNDER DIFFICULTIES IN OLDEN DAYS.

Let us take boots and shoes as an example. A shoemaker would buy his leather at one of the big fairs that were held at different places once or twice a year, or in the market in the nearest town, or from a travelling leather merchant who came to his door. He would make his boots and shoes in his workshop and sell them either in the little shop he had in the front room of his house, or in the market town, or to a man who came round at intervals to collect his work. To-day, though there are still a few of such workers in little towns and villages, most of our boots and shoes are made in big factories at Northampton, Kettering and other places. The leather is bought in large quantities, hundreds of pairs are cut out together by machinery, and each little bit of the work of making is done by a worker specially trained for it. The finished goods are packed in boxes by machinery and sent to large stores to be sold.

The old hand worker was called a master craftsman, because he knew all the processes of his craft or work, and carried on his business independently. If he was only in a small way of business, he and his family did all the work themselves; but often he would have one or two boys to help him in his business. Such boys were called apprentices. They lived in the master's house and were fed and clothed by him. They were not paid much in wages, but they were taught their craft, and when the five or seven years of their apprenticeship ended, they were able to become master craftsmen themselves. There are still apprentices in some skilled trades. But to-day they live in their own homes and go to a factory or trade schools to learn their craft.

LITTLE BY LITTLE INVENTORS MADE LABOUR EASIER.

The change from home industry to the factory system began in the woollen and cotton industries. Exactly two hundred years ago, in 1733, a woollen weaver, John Kay, invented a new kind of shuttle which, instead of having to be passed in and out of the warp threads by hand, could be sent from side to side of the loom by a stick held in the weaver's hand. This "flying shuttle" enabled the weaver



The original spinning machine invented by Sir Richard Arkwright, who had better fortune than Hargreaves, and became rich and famous.

to work more quickly, and so more spun thread was required. This caused John Hargreaves to invent the "spinning jenny," a wooden frame on which a row of spindles was fixed. It was fitted with a wheel turned by the spinner, which wound all the spindles at once. Two other men, Richard Arkwright and Samuel Crompton, improved on Hargreaves' machine and then Edmund Cartwright invented a better weaving machine. All these machines were worked by water power, which meant that factories had to be set up on the river banks.

THE BOY WHOSE BRIGHT IDEA HELPED THE WORLD TO PROGRESS.

You all know the story, I expect, of how James Watt saw the kettle lid being lifted by the steam from the boiling water inside, and how this led him to experiment with the power of steam to produce motion. Edmund Cartwright saw how steam might be used instead of water to work the spinning and weaving machines, and once the use of steam was introduced, the manufacture of cotton and woollen goods increased by leaps and bounds. Bigger machines could be used because the power of steam is almost unlimited. Large factories were built to house these machines wherever coal was available, and later, when transport developed, in districts where there was no coal. Many workers were needed to work the machines, so that the old master craftsmen disappeared, and workers for wages took their place. Much more material was produced, and thus it could be sold more cheaply. Towns grew up round the factories, and men who could find money to build and carry on factories developed big businesses which in time became the business companies of to-day. It is from these beginnings that our great cotton and woollen industries have developed.

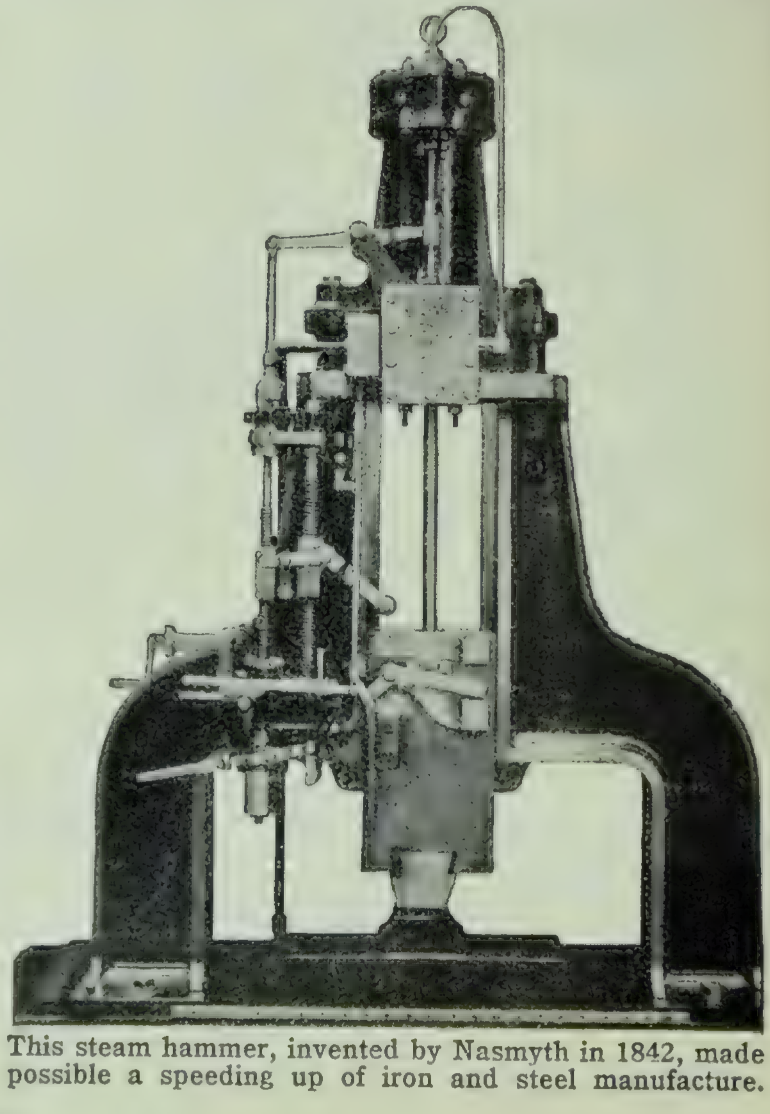
The story of other industries is like that of cotton and wool. In every industry machinery was invented, and first steam power and later electricity were used to drive the machines. The increased demand for coal led to improvements in mining, and so the coal industry developed.

EARLY INVENTORS GET BUSY—LESSENING THE WORLD'S LABOUR

The need of iron and steel to make boilers and better machines brought about great improvements in methods of smelting iron ore and in the making of the many different kinds of steel we use to-day. To carry all the goods to the people who needed them, better forms of transport had to be devised, and so the canals, the good roads of to-day, the railways and motor transport, have gradually become familiar to everybody.

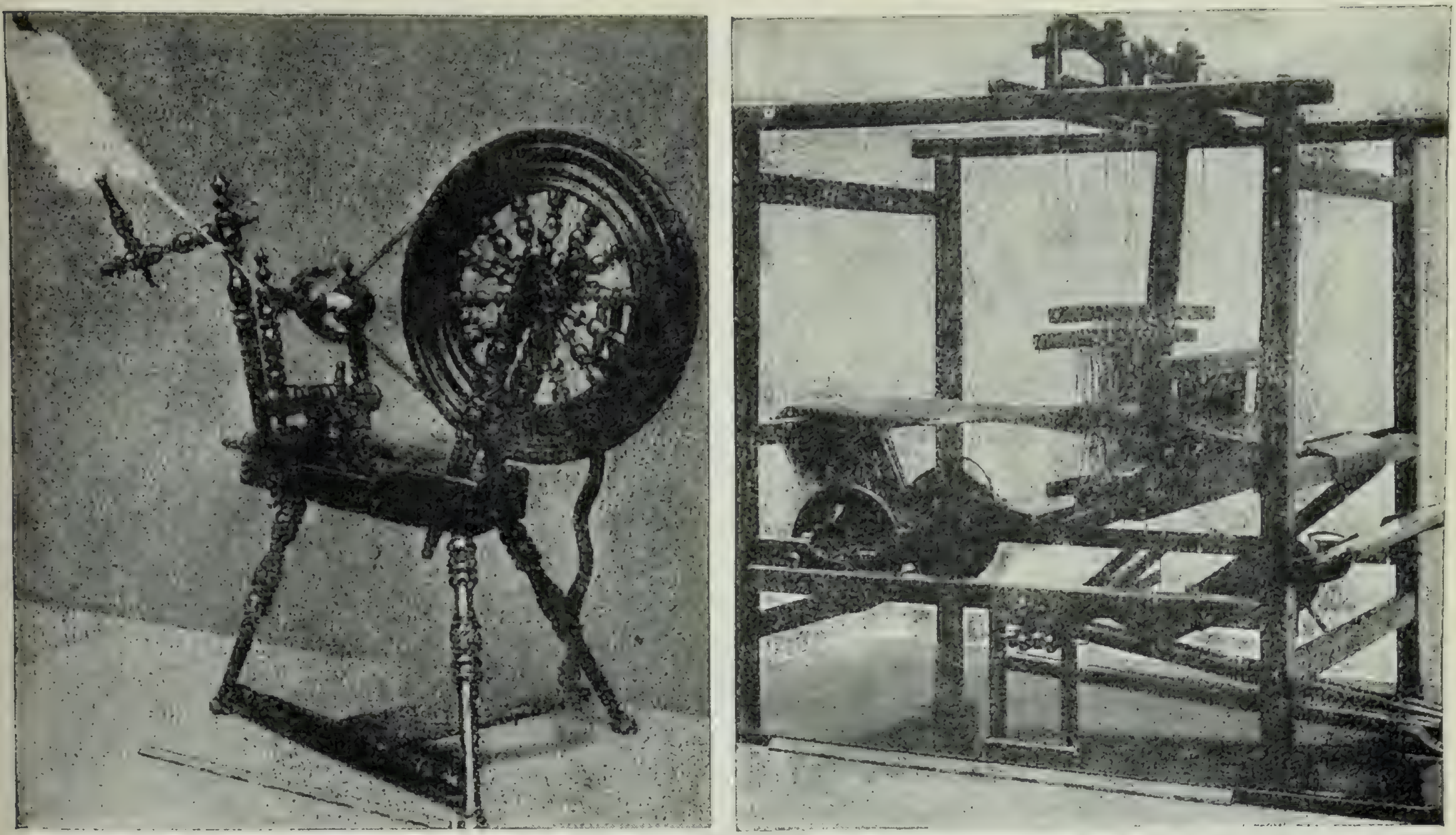
To provide money to carry on all these industries, big banks grew up, and great printing presses were invented to spread the knowledge of all these new things and to provide the newspapers and the catalogues in which manufacturers advertise their goods. The world in which we work to-day is summed up in one word—machinery.

But though machinery has brought many

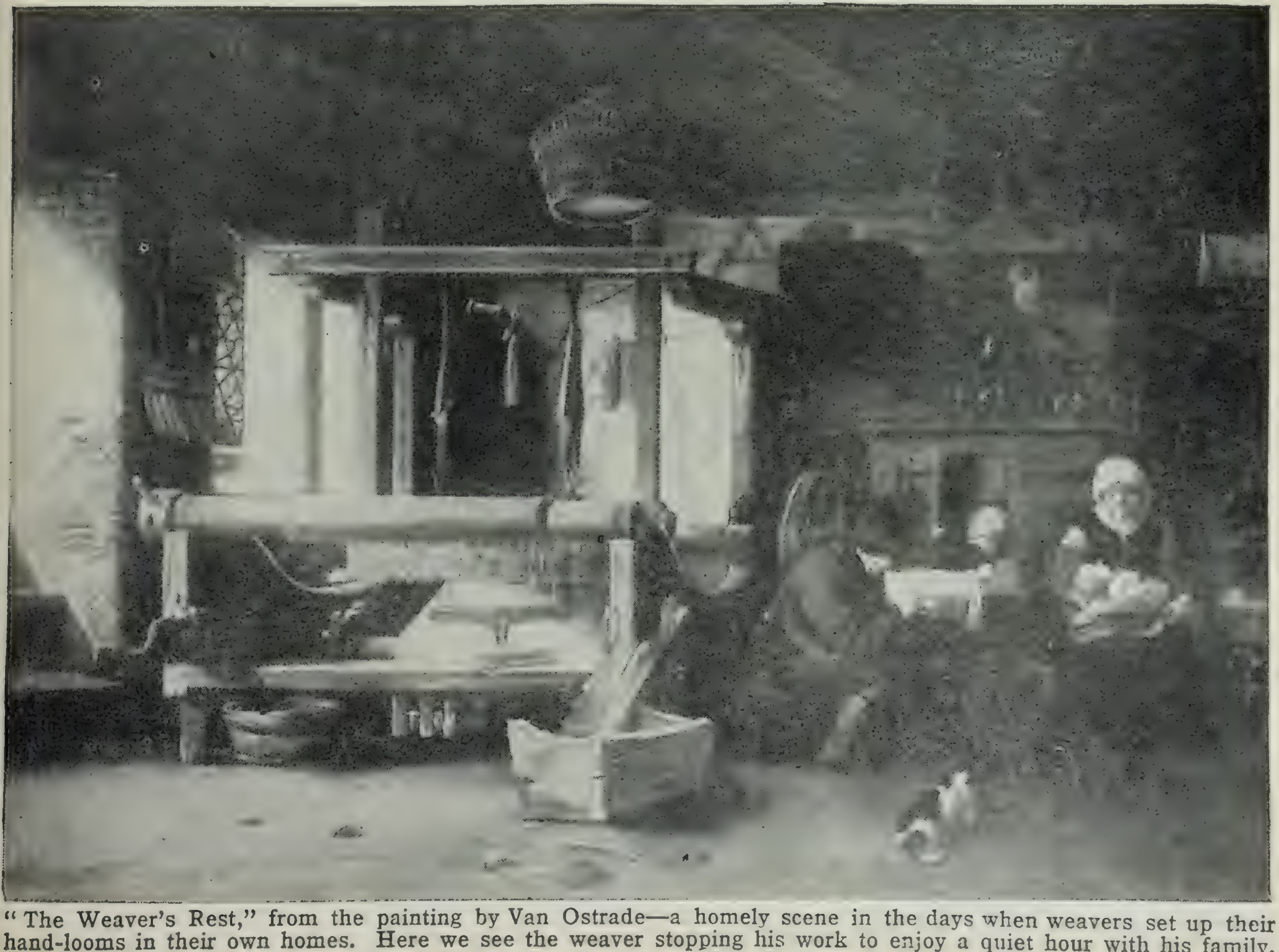


This steam hammer, invented by Nasmyth in 1842, made possible a speeding up of iron and steel manufacture.

THE HOME WAS THE WORKSHOP IN THOSE DAYS

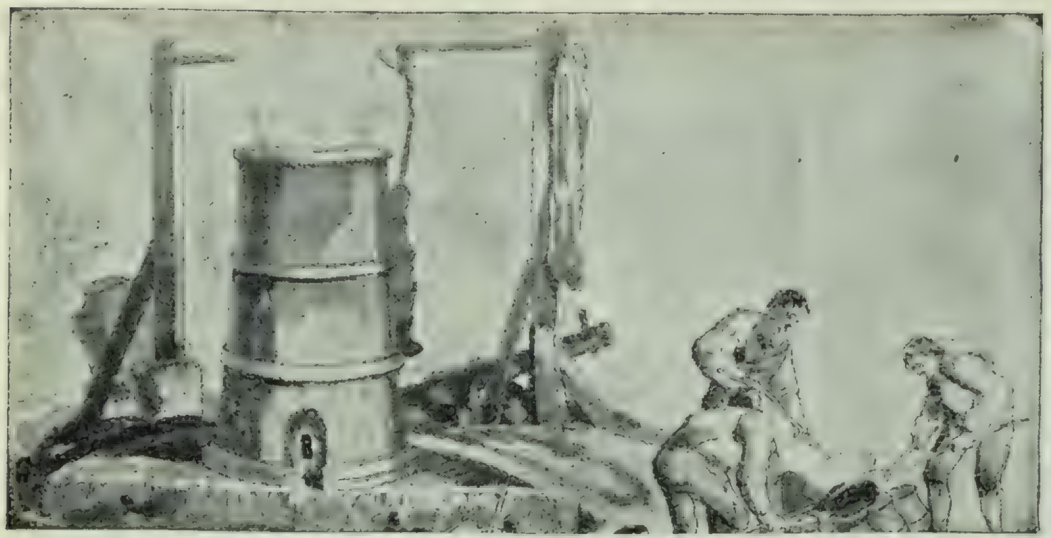


Relics of the past! The spinning-wheel, worked by foot, twisted the fibre into yarn before winding it on to the bobbin. On the right is an old hand-loom giving an idea of the difficulties experienced by hard-working weavers in early days.

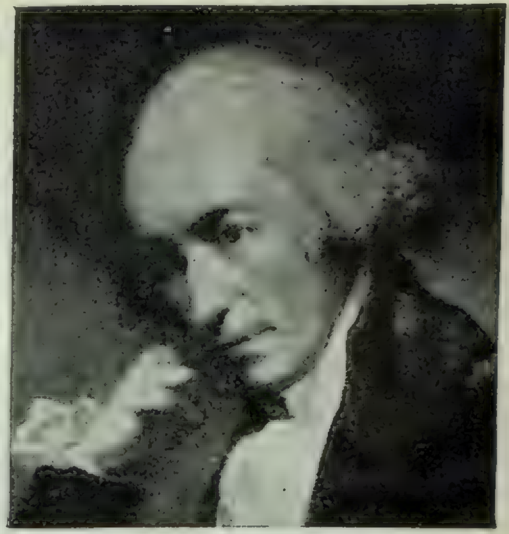


"The Weaver's Rest," from the painting by Van Ostrade—a homely scene in the days when weavers set up their hand-looms in their own homes. Here we see the weaver stopping his work to enjoy a quiet hour with his family.

HELPING US TO HEALTH AND HAPPINESS

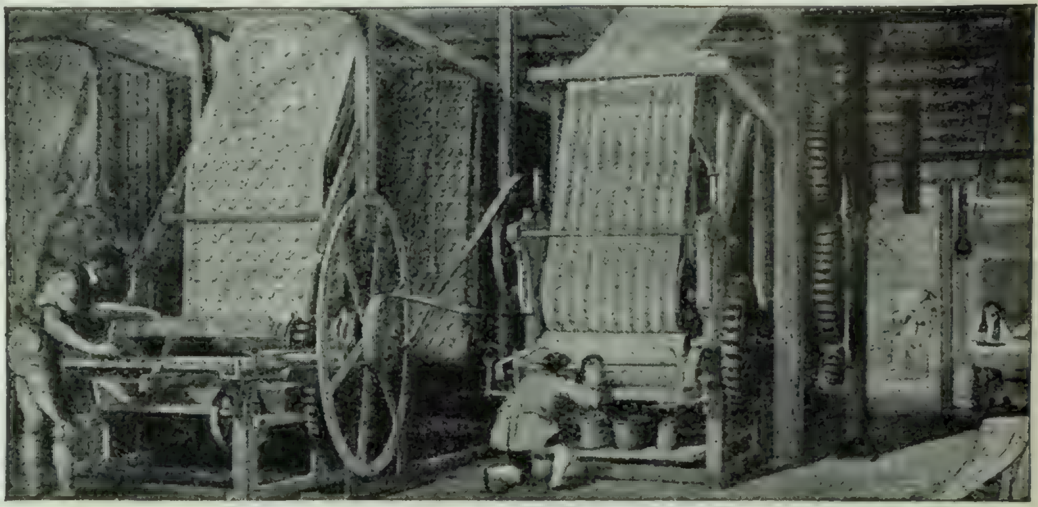


Working at an iron foundry in the early nineteenth century.

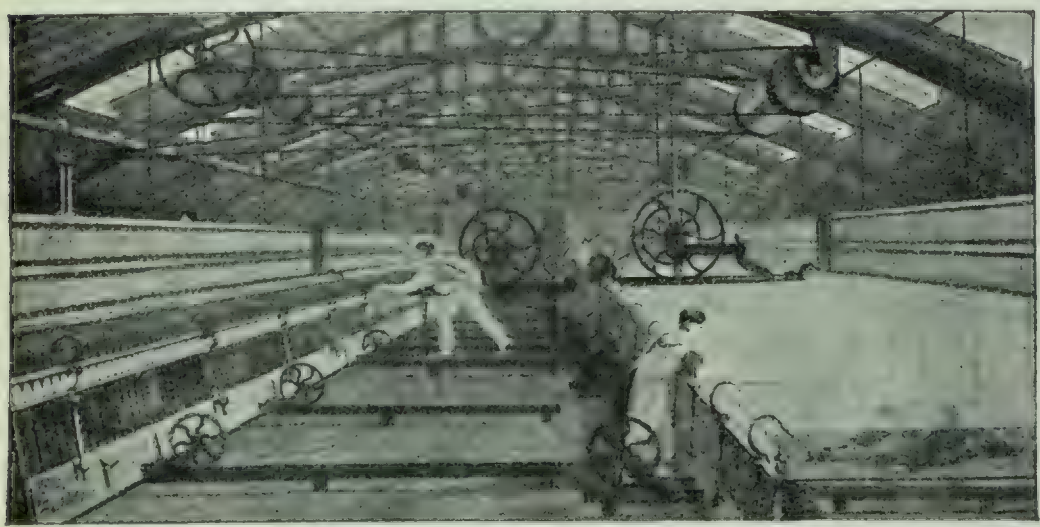


James Watt.

Sir Richard Arkwright.

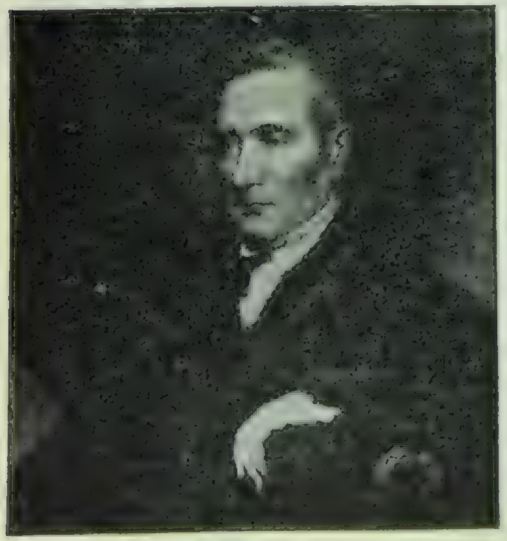


Calico-printing in an old Lancashire factory.

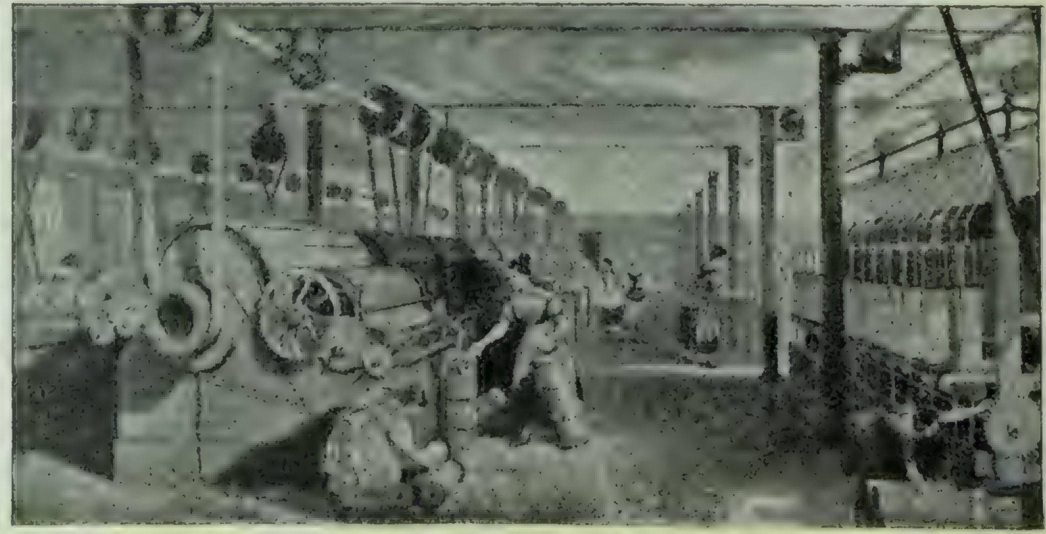


Spinning in a cotton factory. The machines travel backward and forward.

Earl of Shaftesbury.

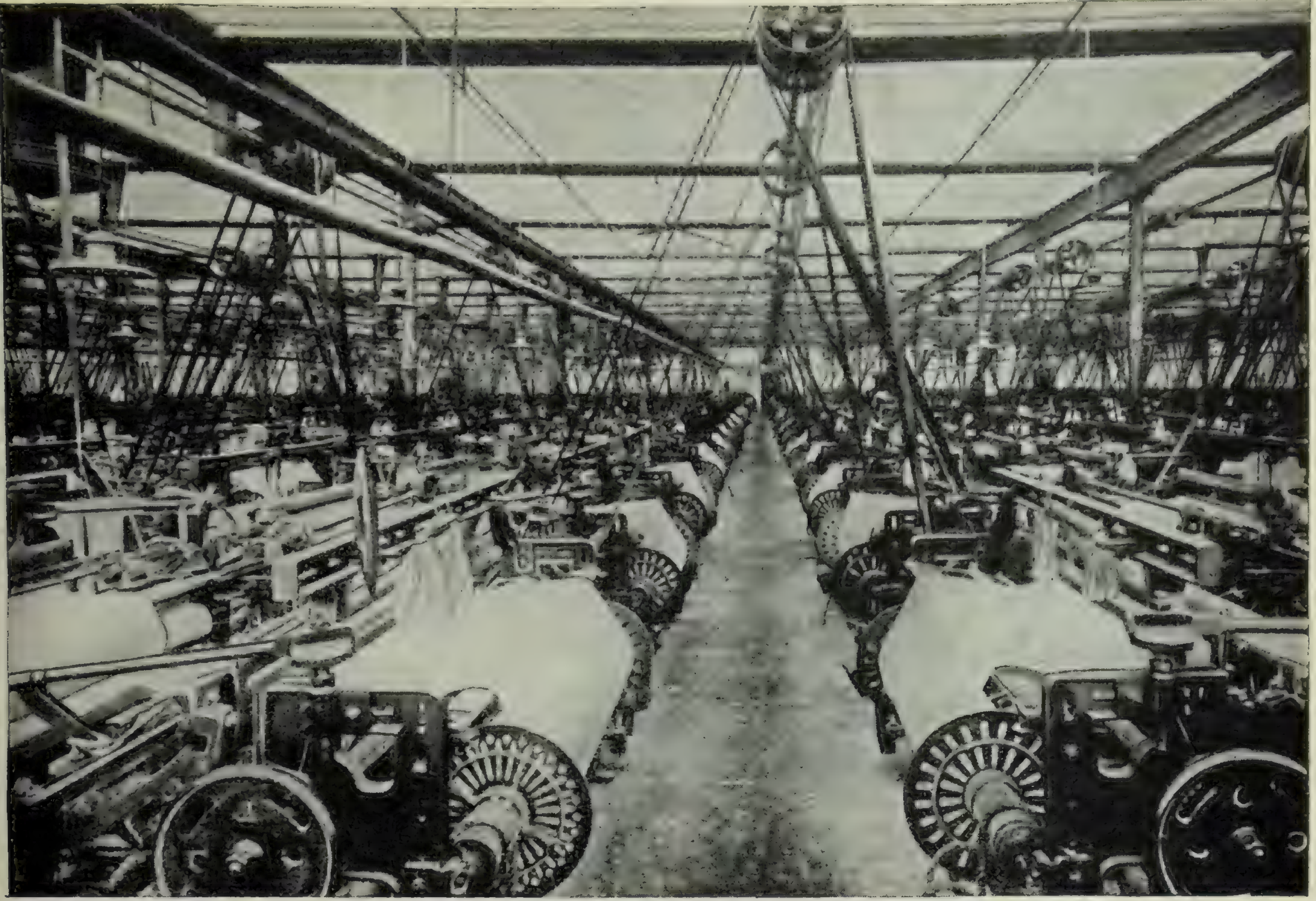


George Stephenson.

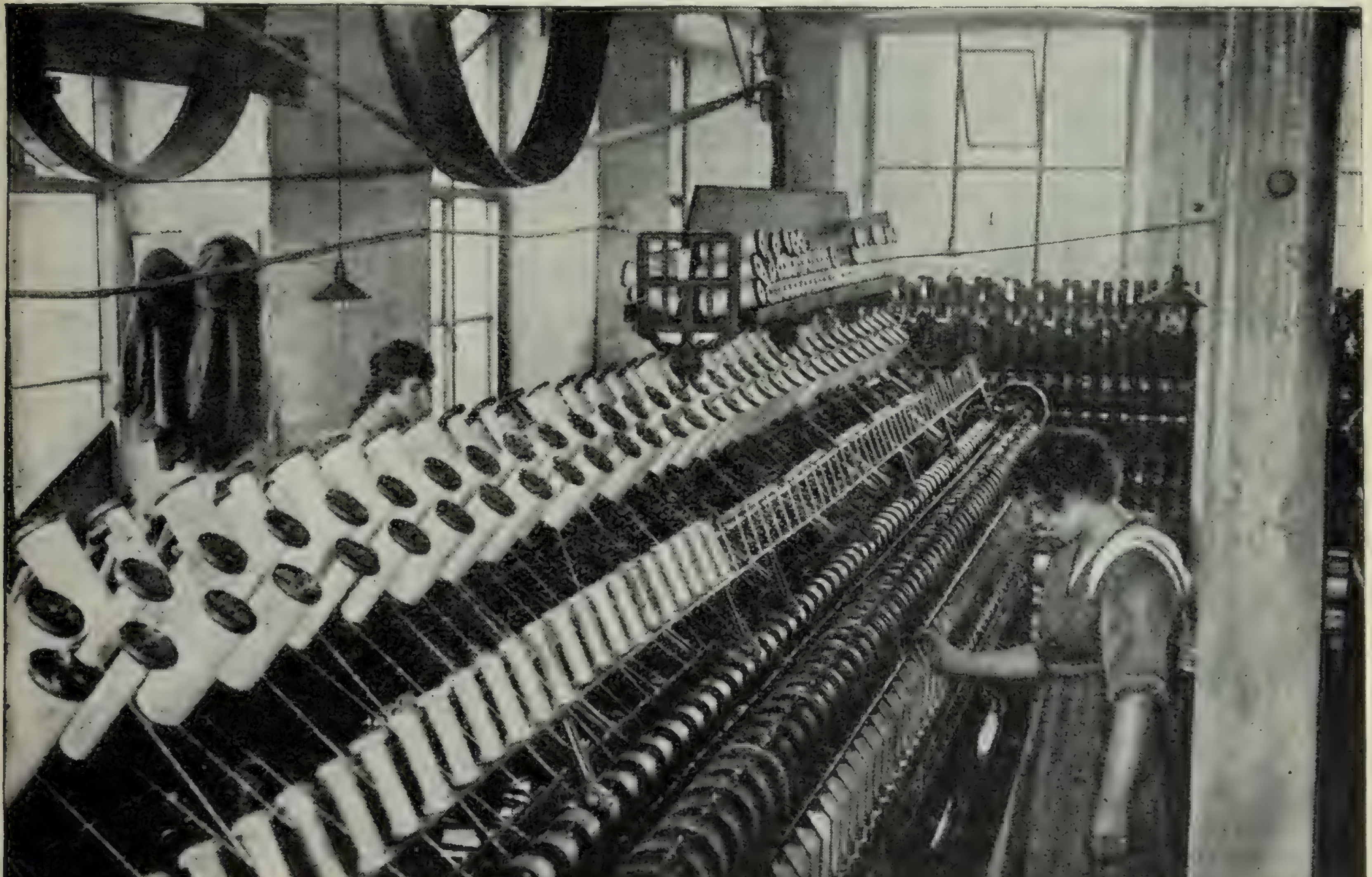


Women and children at work in a nineteenth century cotton mill.

AUTOMATIC WEAVERS AND SPINNERS



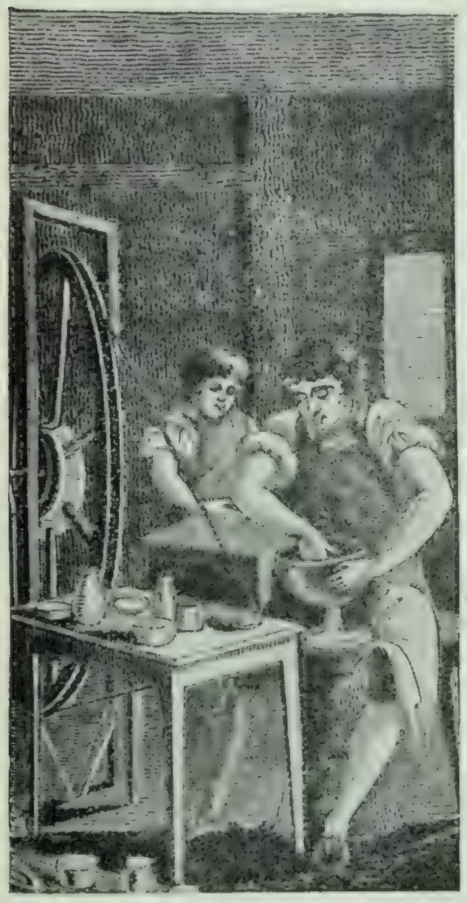
This hive of busy machinery in a cotton weaving factory shows how weaving proceeds automatically at a great pace.



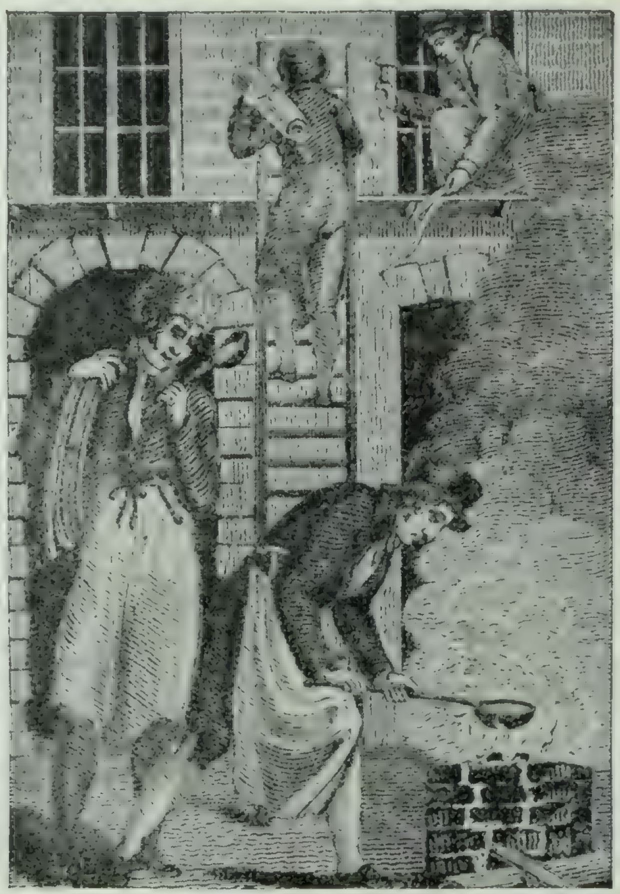
Workers tending the spinning machines—a very tiring task. The girls have to pay very close attention to the threads.

TOILERS OF GREAT GRAND-FATHER'S DAY

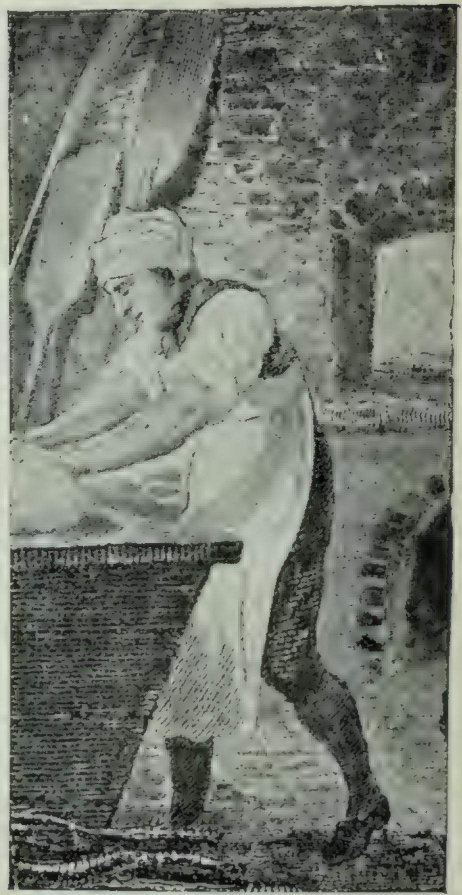
How Men Worked before Machinery came



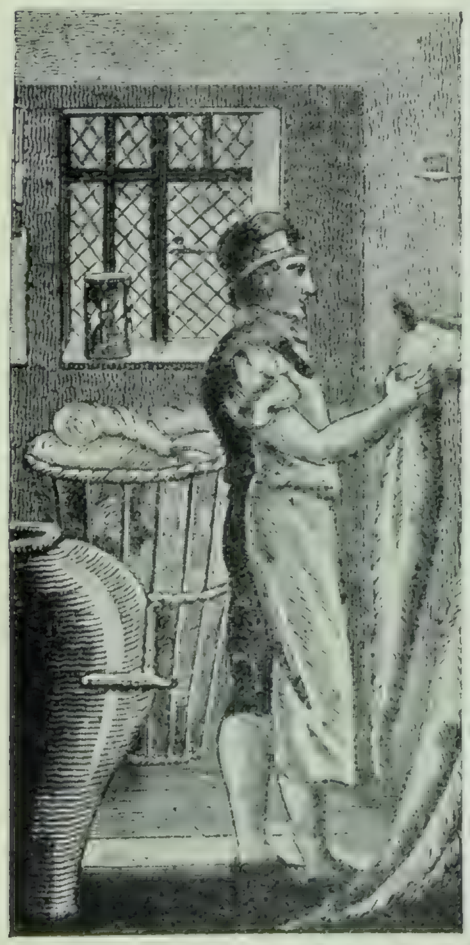
The potter at his work. Josiah Wedgwood was the pioneer of pottery in the eighteenth century. Wedgwood ware is now very famous.



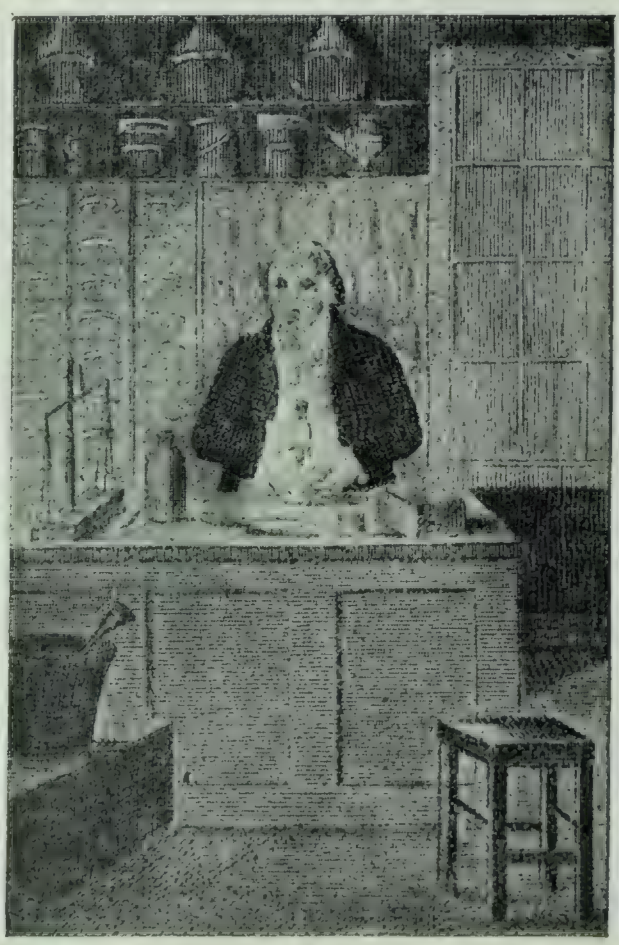
Here is the plumber at work on a house. He has three helpers and is melting his lead at an open fire. In the early days of last century labour-saving was unknown.



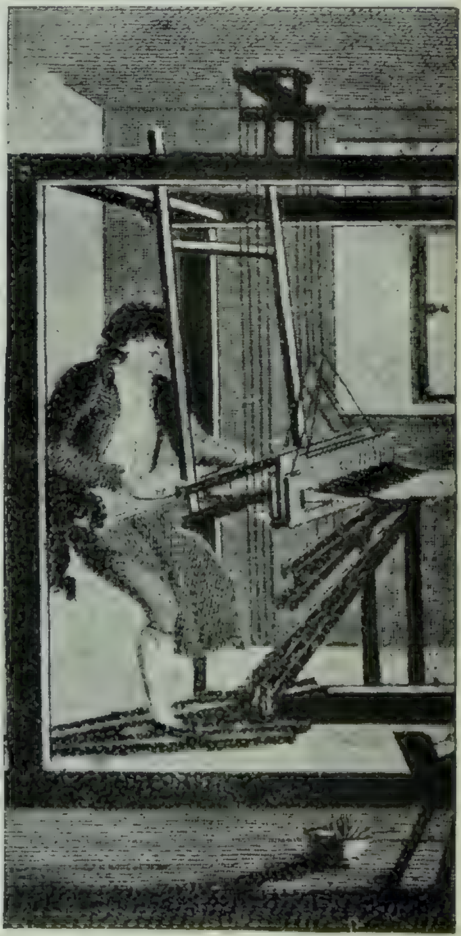
The bread was kneaded by hand in the days of great-grandfather. Nowadays this is done by machinery, and is electrically baked.



The woolcomber's work was very important, as he was responsible for supplying the spinners with good wool, in perfect condition.



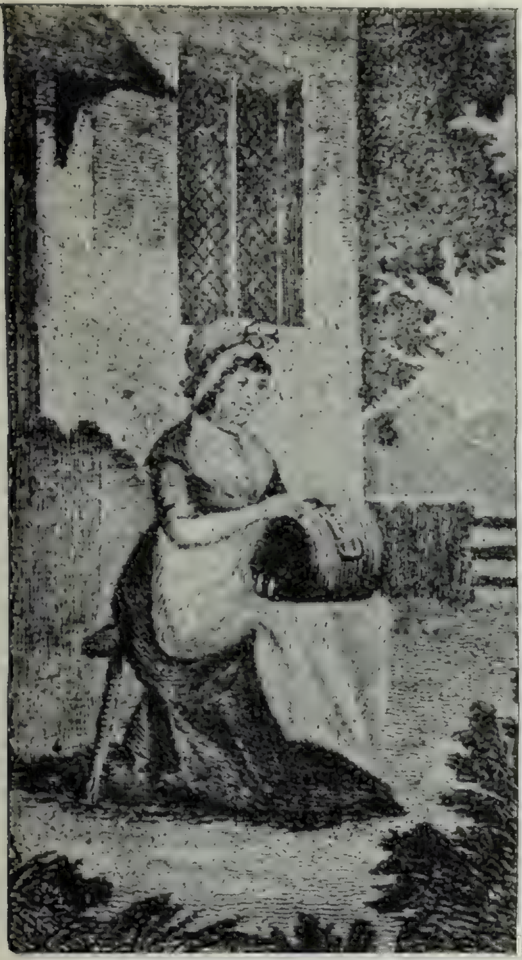
The nineteenth century apothecary, who represents our modern chemist, is here seen busy pounding medicines with pestle and mortar in his quaint little chemist's shop.



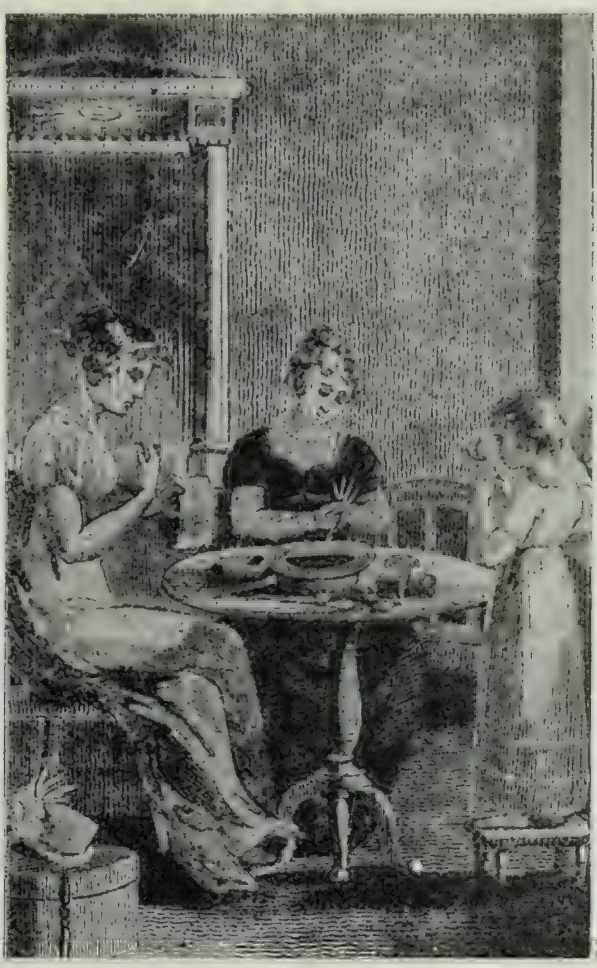
The weaver worked at home on a hand-loom, throwing the shuttle containing the weft or woof to and fro. This method was very slow.

WOMEN WORKERS ERE THE FACTORIES CAME

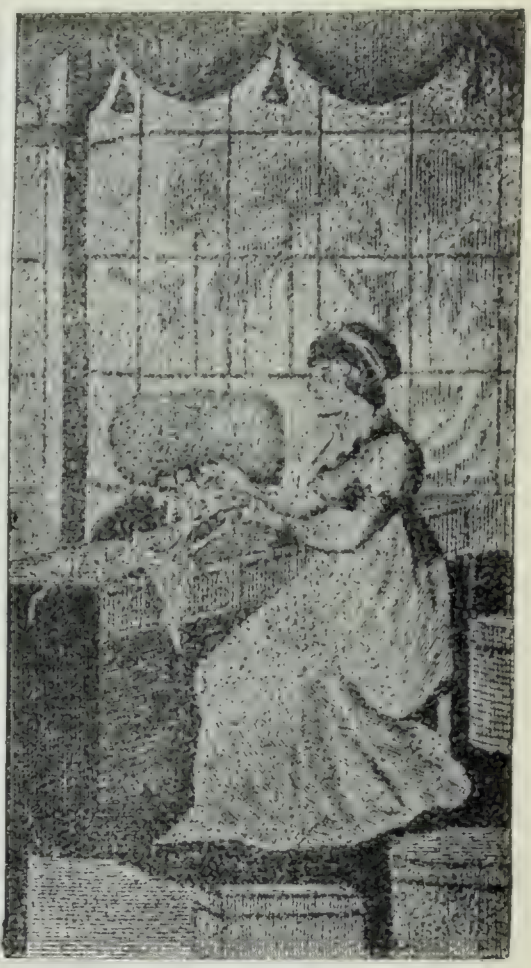
Family Occupations of Last Century



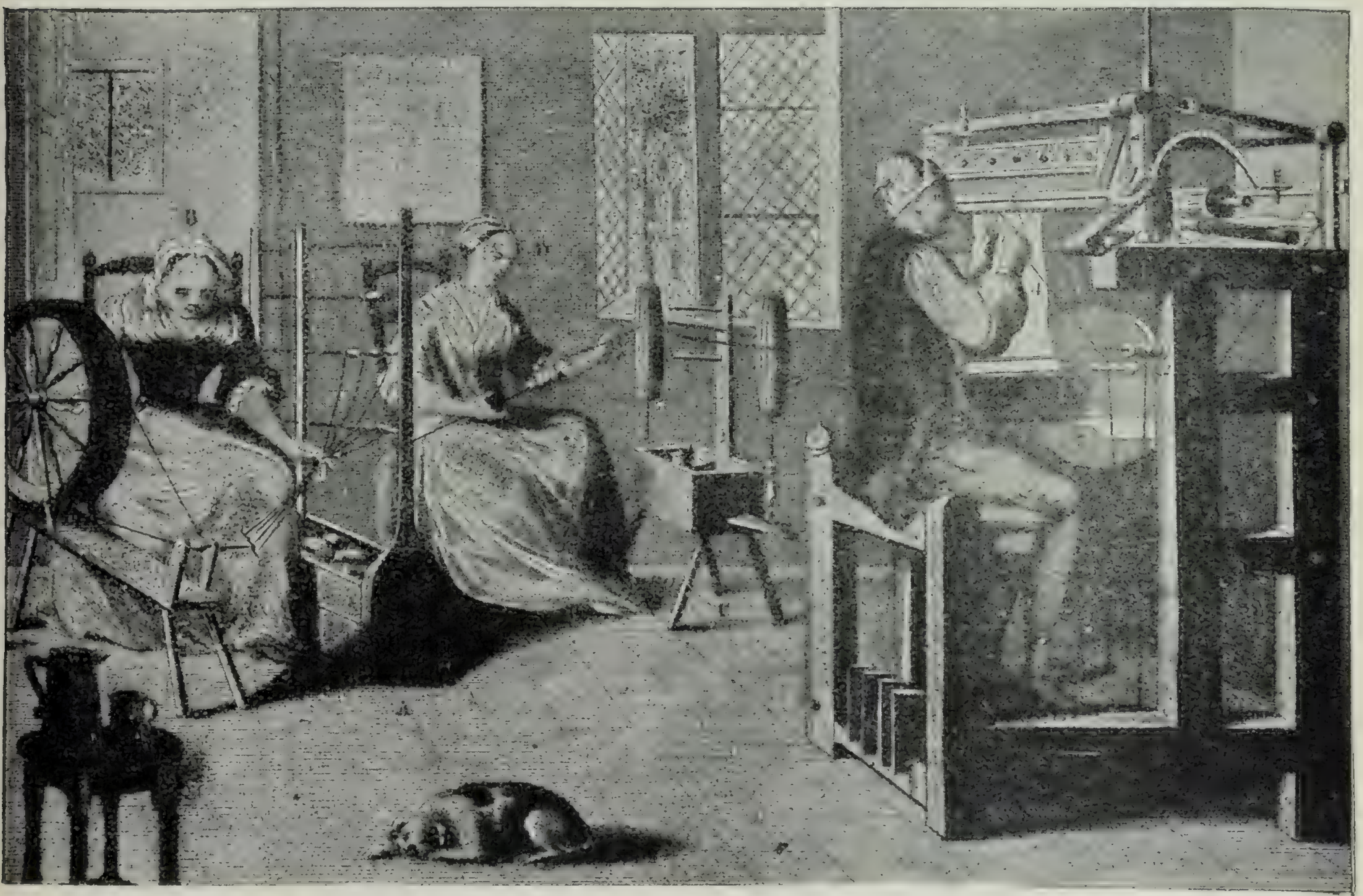
An early nineteenth century woman making lace outside the door of her pretty cottage. The art of lace-making is now dying out.



Women and a little girl at work on straw hats. There were no factories, and work was all done by hand in the home. This process was very slow and tedious.

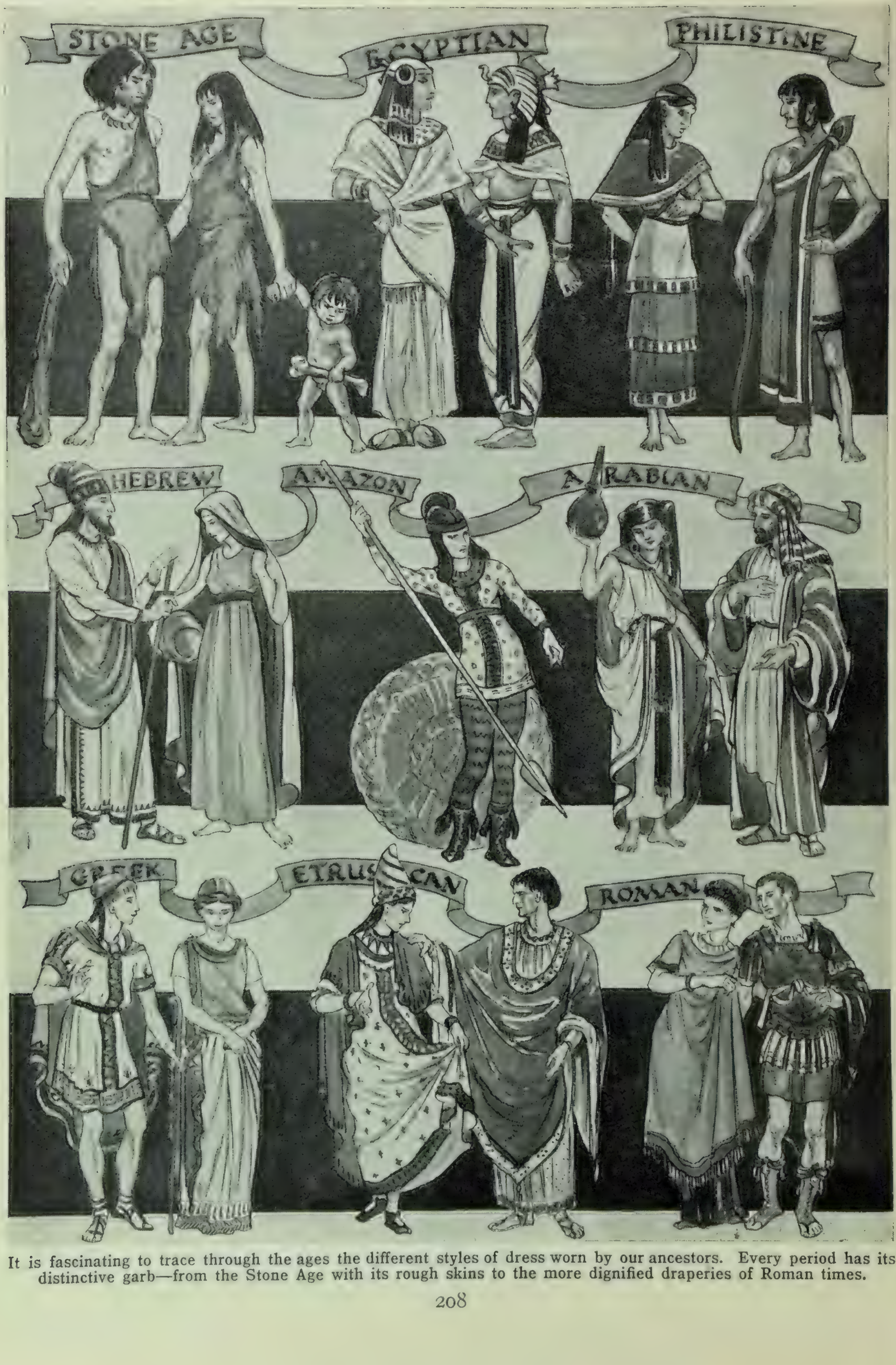


The nineteenth century lady milliner at work. Note the shop window with its many panes of glass. Ladies of fashion in those days wore very elaborate hats.



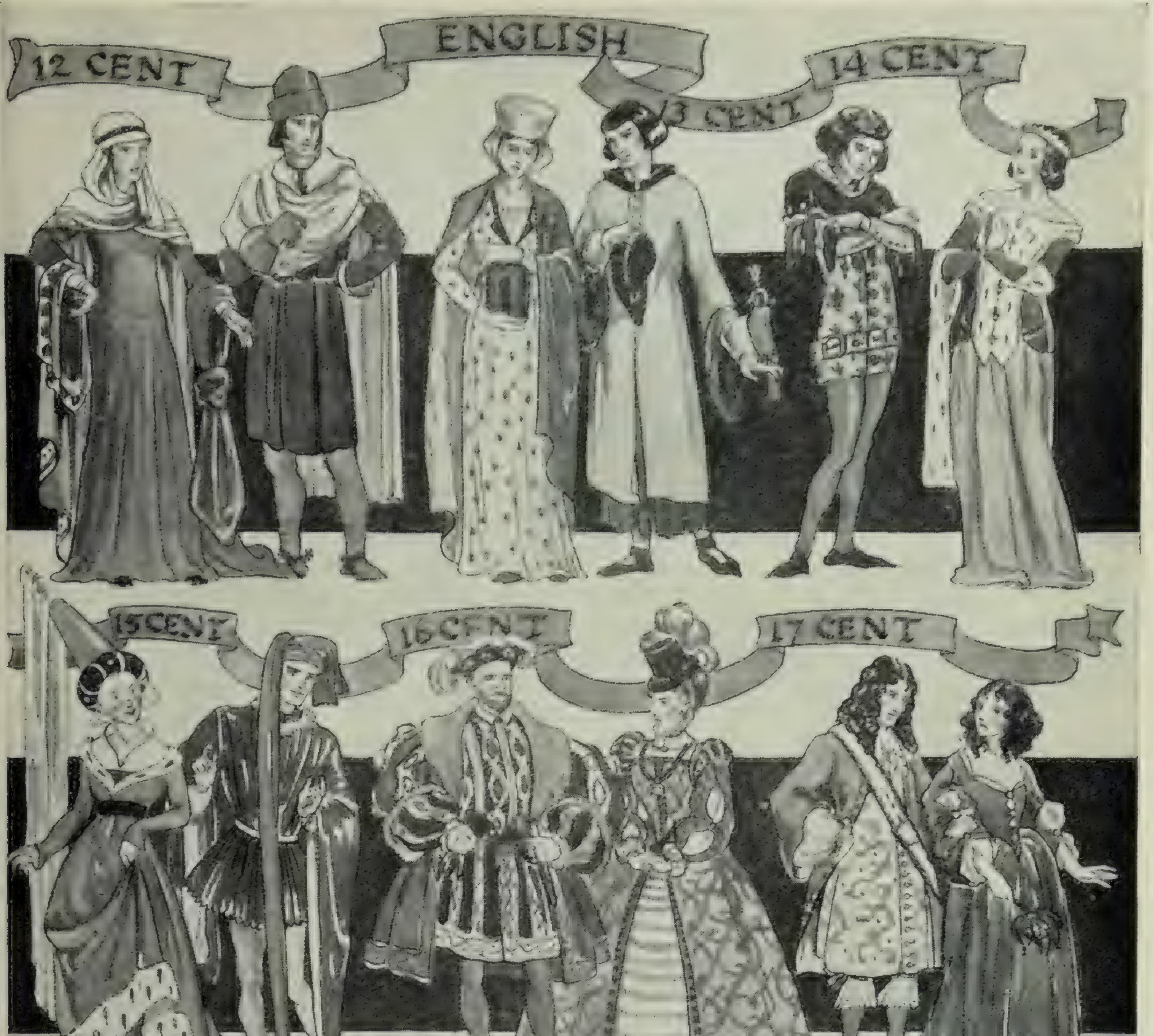
A hundred years ago the factory system had not come to herd the workers together in mills and workshops. Here are mother, father and daughter at work making stockings in the home. Mother and daughter prepare the yarn while father knits it on his curious loom. The whole house hums with industry.

THE ANCIENTS HOLD A FASHION PARADE


STONE AGE
EGYPTIAN
PHILISTINE
HEBREW
AMAZON
ARABIAN
GREEK
ETRUSCAN
ROMAN

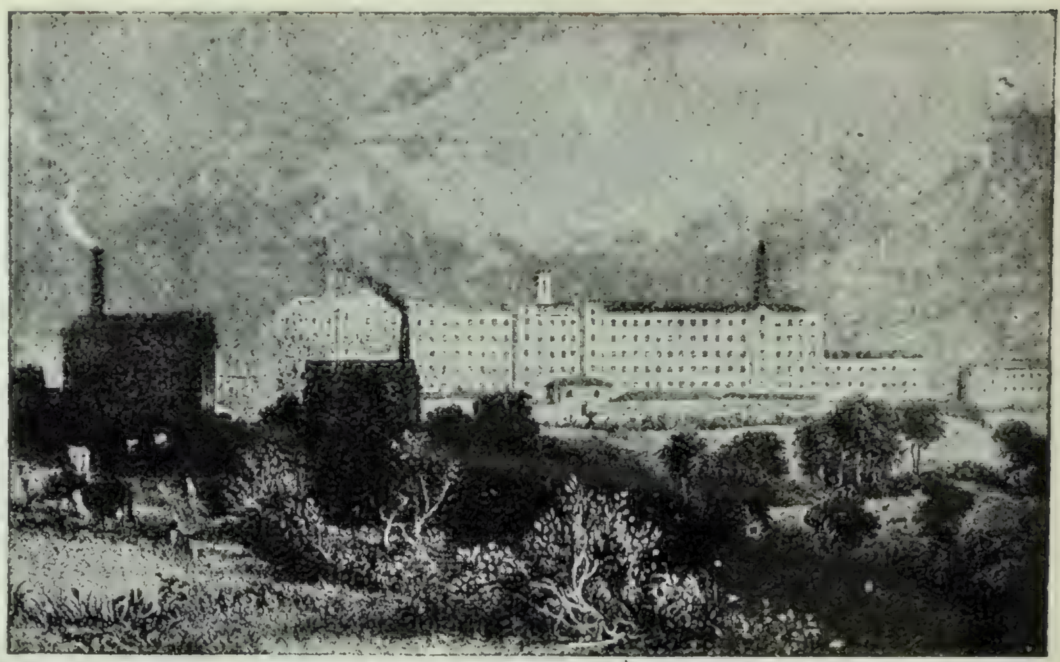
It is fascinating to trace through the ages the different styles of dress worn by our ancestors. Every period has its distinctive garb—from the Stone Age with its rough skins to the more dignified draperies of Roman times.

PICTURESQUE DRESSES OF OLDEN DAYS


ENGLISH
12 CENT
13 CENT
14 CENT
15 CENT
16 CENT
17 CENT
18 CENT
19 CENT
1ST HALF
2ND HALF
Christina S. Reed.

It is only when we don fancy-dress that we get an idea of how our ancestors looked in the far-off days of crinolines and knee-breeches. The above picture shows the development of dress through eight centuries of time.

good things into our lives, it had at first some bad results. The factory system changed completely the working lives of most people. The big barrack-like buildings in which men worked were often cold and damp and dirty, and so their health suffered. Because the demand for labour was so great and wages were so poor, women and children went to factories and mines to work too. When people crowded from the country to work in the factories, there was no time to build well-planned and roomy houses for them, and so slums arose.

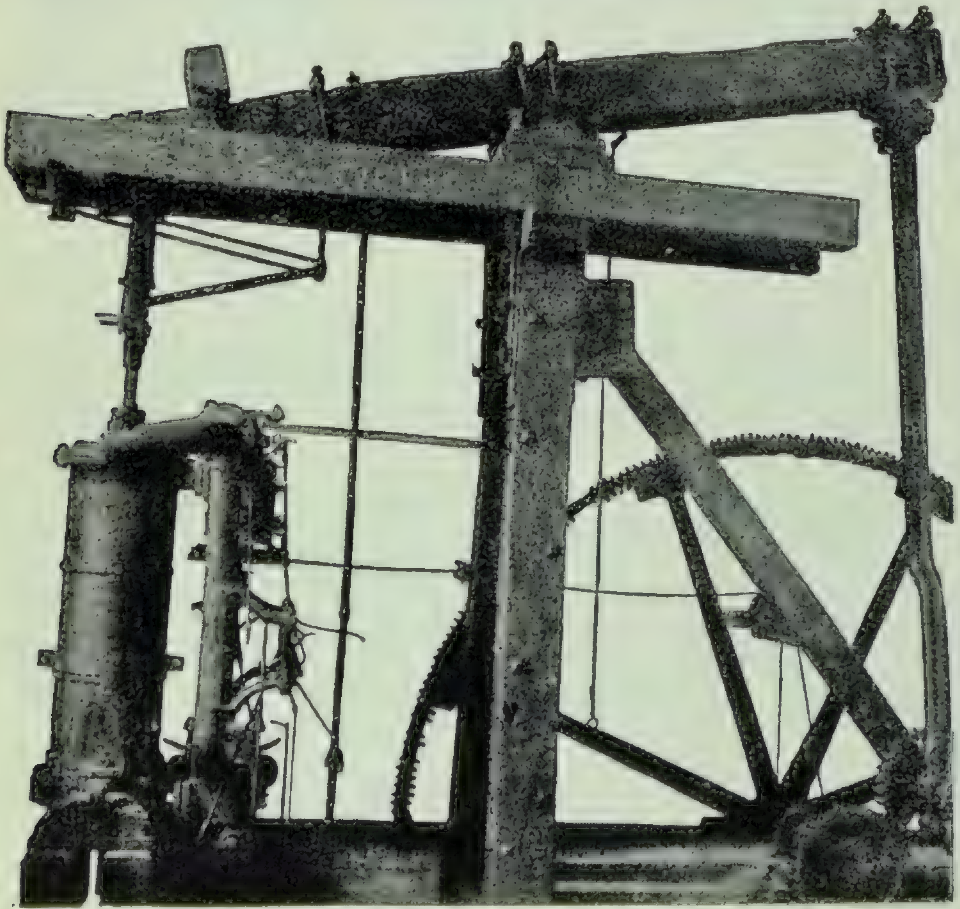


Cotton factories in the old days, when women and children toiled for long hours in unhealthy conditions. The law intervened and abolished such slavery, conditions improved greatly, and work was made easier and quicker.

Nobody at first took any pains to see that the workers did not work too long hours, or that they were properly protected from dangers arising from the whirring machinery or from explosions in mines. No one thought about children going to school or having proper time for sleep and play. The factory owners were too busy making and selling goods to have time to think of their workers, and so there was a great deal of suffering and misery.

But in time some of the factory owners and people who had leisure to think about the workers began to try and improve their conditions. The man whose name will always be associated with this movement was Lord Shaftesbury. He worked untiringly to make people see how wretched the lives of the working classes were, and to persuade Parliament to make laws to help them. In 1833, the first Factory Act was passed, which said that no boy or girl should work at night or for more than twelve hours a day. During the nineteenth century this law was followed by many others dealing with hours of labour for men and women and with conditions of work in factories and other places. To-day a great deal of the work of Parliament is concerned with making laws to make people's work as safe and as healthy as possible.

Another result of factory work and the general use of machinery is that workers no longer make a whole article themselves, as they did in the days of home industry. Each worker tends one machine doing one particular bit of work, and then passes on the work to another who does another little bit, and so on till the article is finished. It is the same in shops and offices. Each person has his own little bit of work which he goes on doing hour after hour and day after day. This is called specialisation. It makes it possible to produce things more quickly and more cheaply, but



Two heads are better than one! This was found true when James Watt and Matthew Boulton joined partnership and invented labour-saving engines to speed up work. Note how clumsy they look.

it is very tiring for the worker. People to-day do not find the pleasure and variety in their work that they did before, and so they need more rest from work and more recreation. Laws have been made to try to ensure this; for instance, in 1911 an Act of Parliament was passed saying that all shop assistants must have a weekly half-holiday. Employers, too, often help to give their workers rest and recreation. They provide rest rooms in factories, and sports grounds and clubs for amusements, so that their workers can easily obtain the recreation which will enable them to keep well and to do their work properly.

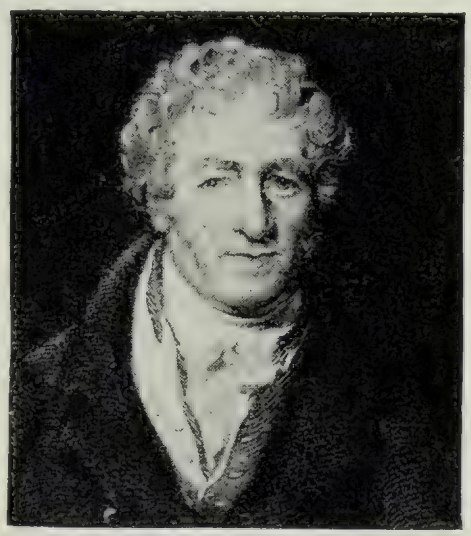
The number of things we can buy and the variety of employments in the world to-day are far greater than they were two hundred years ago. We have new products such as aluminium, rubber floors and artificial silk, and there are all sorts of new processes in industry which only the skilled worker knows. Men of science working in laboratories, business men building and organising factories, and artisans working at their own particular piece of work all help to achieve this. But none of it would be possible were it not for the wonderful machines that are made now, and the use of steam and electricity to work them. The way in which the work of the world is done to-day is one of the great modern wonders.

Less workmen are needed to work modern machines than were necessary to turn out the same amount of work in olden days. So you see that even progress brings other problems in its train.

WHY DO YOU CALL A POLICEMAN A BOBBY?

THE POLICE WERE ONCE KNOWN AS "PEELERS." WHY?

MOST of us know what happens if a motorist drives too fast along a public road. The policeman stops him and takes his name and address. Then he receives a summons to attend a court where the matter will be looked into. If the policeman catches a burglar trying to break into a house, he does not take his name and address; he takes him to the police station, where he is kept until he is brought up before the magistrates. Besides doing this kind of thing, the policemen control the traffic in our large towns, see that we have locked our doors properly at night, help children across the road, direct us if we have lost our way, and many other things. It is the policeman who sees every day that the laws made by Parliament are kept, and order and security are the rule throughout the country.


Sir Robert Peel.

We are so used to our friendly policemen that we can hardly imagine a time when there were none. Yet it is less than a hundred years ago that the police force was set up. Before 1839 order was kept by constables, men who were named for the work by the magistrates in town and country. Nobody could refuse to be a constable, but men hated the work and it was usually badly done. At night the streets were guarded by watchmen, who often spent most of their time dozing in their boxes. So Sir Robert Peel decided to get rid of the old constables and watchmen, and replace them by a properly trained force of policemen, the men with the blue uniforms so familiar to us to-day. From his name comes the nickname "bobby," and also another name we do not hear so much to-day, the name "peeler."

At first the new police force was only set up in London. But since Peel's time it has been extended all over the country. There are police stations in every town and village, and at Scotland Yard in London there are policemen who have special duties, and detectives who inquire into crimes and bring criminals to justice. The latest kind of police officers are the "flying squad," which dashes about the country in swift cars to catch motor bandits. Though most people willingly keep the laws that Parliament and the king's ministers make, there will always be found some people who break them. It is our wonderful police force that helps to keep us secure from such people.

When people break the laws they must be punished. If their offence is only a small one, they will appear in the police court, and the case will be heard by the magistrates, or "justices of the peace," who sit there. But if they have done something very wrong, such as killing or wounding another person, or breaking into somebody's house, they must be tried in more important courts. These may be "quarter sessions," so called because they are held by the J.P's. four times a year in the chief town of the county, or the High Court of Justice. The judges of the High Court may sit in London, as they have done for six hundred years, first at Westminster and then at the Law Courts in the Strand, which were only opened fifty years ago. Or they may travel round the country and hear cases in the county towns. Courts held by the High Court judges in the counties are called Assizes. They began in the days of Henry II., who sent his own judges round to hear cases of breaking the "King's peace."

The Law Courts in the Strand, London. These fine buildings were opened by Queen Victoria in 1882. They are the headquarters for the administration of the law in England, and contain many separate courts.

One of the great differences between the police courts and the high courts is that in the last the judges do not try the case alone. They have a jury of twelve people to assist them. With a few exceptions, any man or woman who is a householder, that is, who owns or rents a house or flat, is bound to serve if called on. The jury hears the story of the case, or the evidence, as it is called, on both sides, and then decides whether the person accused is guilty or not. If they give a verdict of guilty, the judge, who knows the law, says what punishment is to be given. This method of finding out whether a man is guilty of a crime or not goes back to the time of Henry II., who set up juries in the twelfth century because he thought that the best way of finding out the truth was to let the people who lived in the neighbourhood say what they knew about the crime. The ordinary jury of to-day has come about through Henry II.

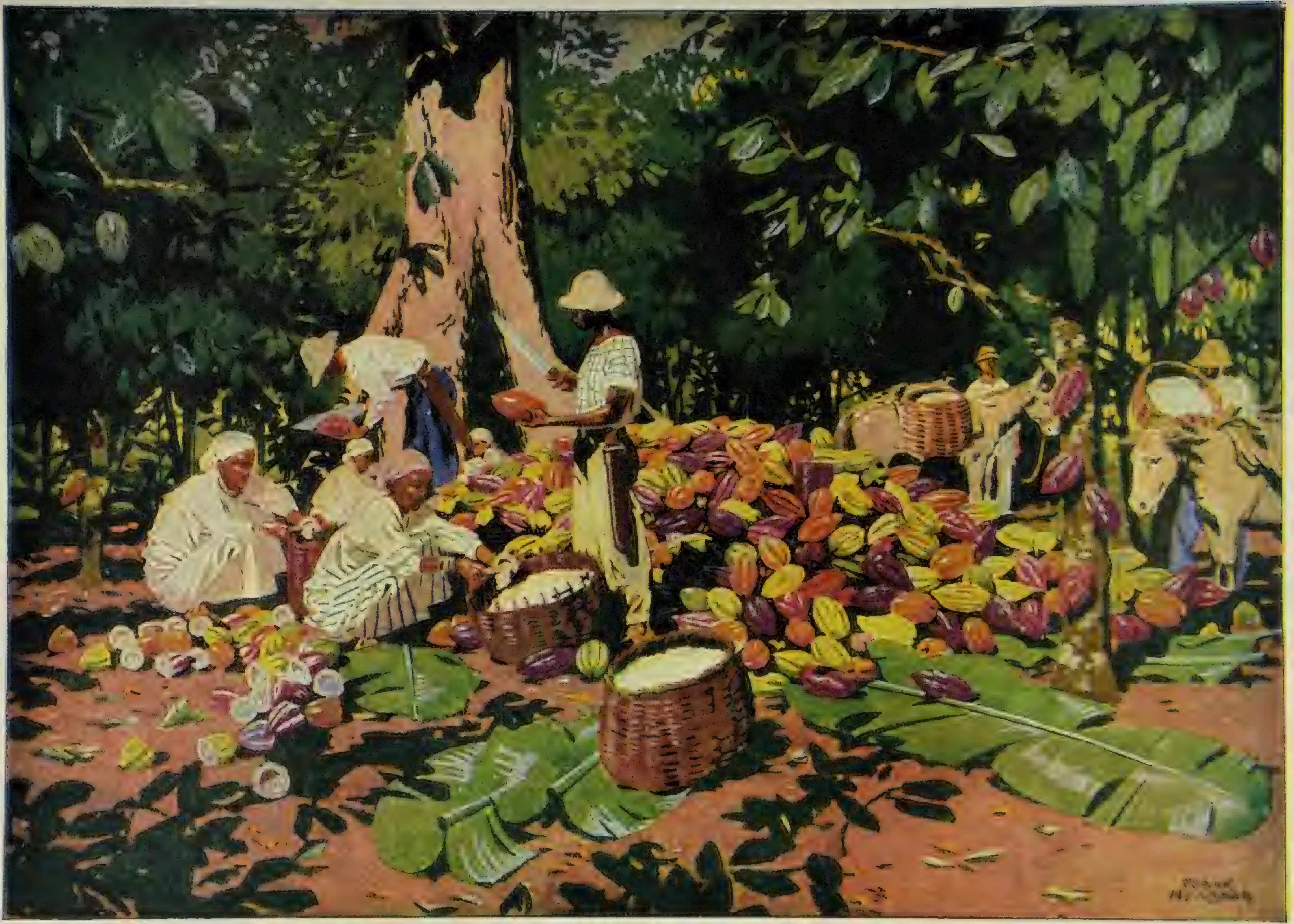
By jury service people help to see that the laws which they have caused to be made are kept. We are so used to this way of keeping order that we do not think it at all marvellous. But if we think of the time when men lived alone very uncomfortably because they were afraid of other people, and know something of the time and thought it has taken to develop modern security, we shall realise what a wonderful thing it is.

INTERCOURSE WITH OUR NEIGHBOURS

SUPPOSE you want to send a message to a friend some distance away. You will probably write a letter, but if you are in a great hurry you can send a telegram, or telephone. If your friend is in America, you can send a letter by air mail or transatlantic telephone, or you can cable a message. Or even, if you have plenty of money, you can send a message by wireless and get in touch with your friends very quickly.

You know you will do any of these things through the Post Office. But do you know what a wonderful organisation the Post Office is, how many postmen are employed collecting and delivering letters, how many people work at sorting the letters for their different destinations, how many mail trains, steamers and aeroplanes carry letters and parcels to all parts of the world? You would be surprised to know how many people are employed to send the telegrams which are handed in at different post offices, and how many telephone operators are needed to connect the people who want to talk to one another. And all this great business has been carefully built up in the last century, and is managed by the Government for the convenience of us all.

What do you think people did when there were no post offices? How were they able to



BREAKING COCOA-PODS IN TRINIDAD.

The breaking of cocoa-pods in some way resembles the splitting of coconuts for the preparation of copra. The pods are deftly struck with a cutlass and split in half. The beans are then scooped out by skilled native workers.

[Reproduced, by courtesy of Cadbury Bros., Ltd., from the painting by Frank Reynolds.]

THE MAJESTY AND EFFICIENCY OF THE LAW

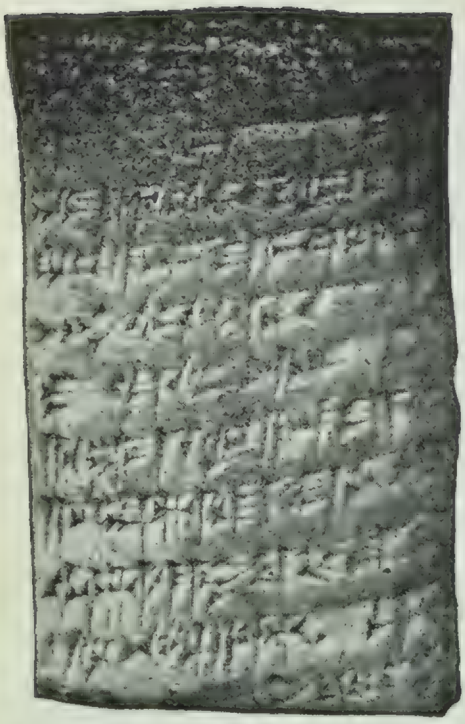
Judges, barristers and other members of the legal profession leaving Westminster Abbey for the House of Lords.

The Lord Chancellor in his robes of office.

The " Flying Squad " in the West Riding of Yorkshire.

London's latest traffic signals are operated by a constable placed high above the street in a control box.

[*Photos.: Topical and Central Press.*



A curious letter of ancient Assyrian times—written on clay.

keep in touch with their friends and relations at a distance? Well, most people were not able to do this at all. Kings, who had to send instructions to the governors of distant provinces or to the generals who commanded their armies, sent them by a special messenger, or, like the King of Persia, they might have regular postmen who rode on horseback between certain places, and handed on the letters they carried to the next man when they reached the place at which their own journey ended. Merchants who wanted to write letters about their business made arrangements with other traders who were going on journeys with goods to sell to carry these for them. But if other people wanted to send letters, they had to send their own servants with them. This was very expensive, so ordinary people did not write letters unless it was about something very important.

WHEN DID THE POSTAL SERVICE REALLY BEGIN IN ENGLAND?

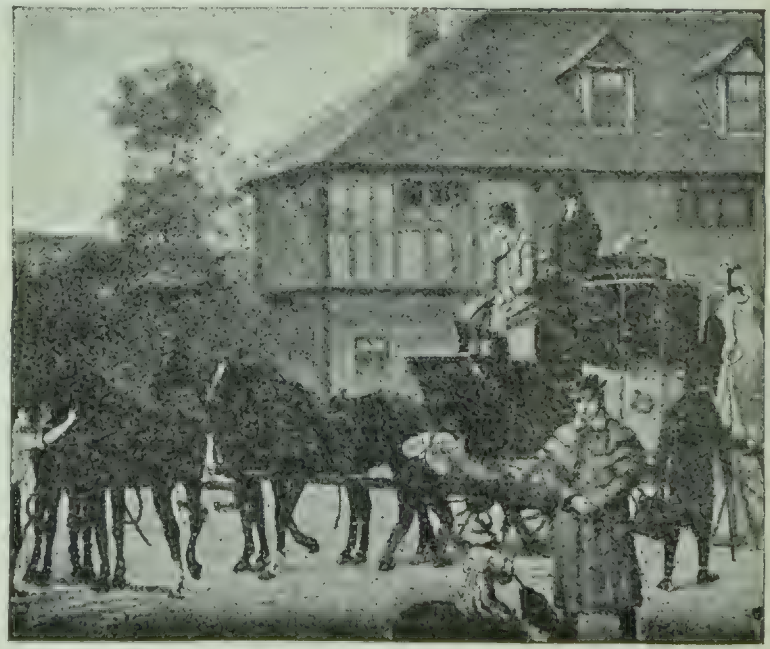
The postal service began in England about five hundred years ago, when the king and his ministers arranged that people who liked to pay a fee could have their letters carried for them by horsemen kept specially for the purpose. These were the first postmen. About two hundred years later, a special minister was appointed to look after the postal service, called the Master of Posts and Messengers. To-day we call this minister the Postmaster-General. At this time there were no stamps and no fixed charges, and the Master of Posts charged people what he liked, often very large sums, for sending their letters.

This was not very satisfactory, and soon a fixed scale of charges was arranged. The amount to be paid for sending a letter was according to distance; it cost 8d. to send a letter from London to Cambridge, and 1s. from London to Durham. Besides being expensive, the postal service in those days was very slow; for although, when roads were improved in the eighteenth century, letters were carried by mail coach instead of by horsemen, the coaches were slow heavy vehicles which took a long time to travel any distance.

ROWLAND HILL AND THE COMING OF THE PENNY POST.

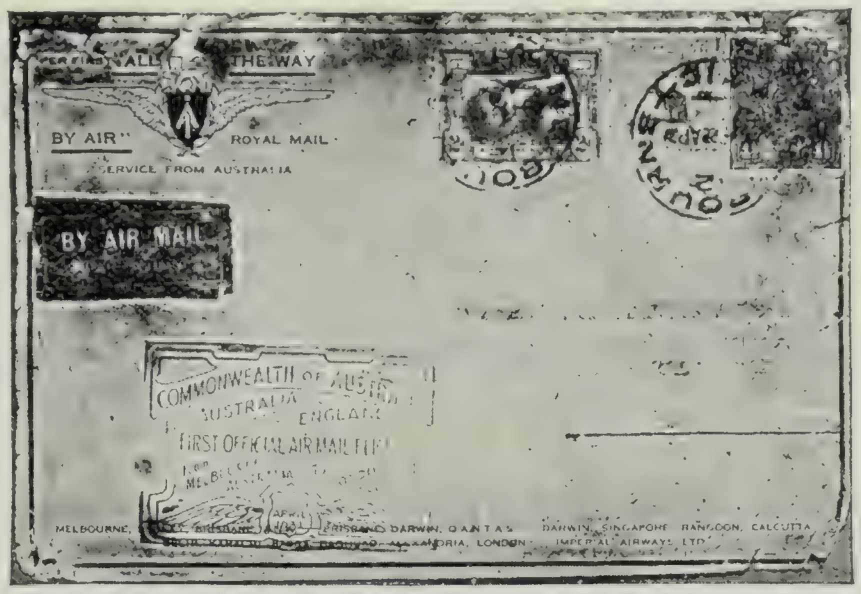
When railways were built in the reign of Queen Victoria, letters could be carried much more quickly by mail train, but the charges were still very high. Then a man called Rowland Hill took the matter up, and proposed that all letters under a certain weight should be carried any distance in the United Kingdom for a penny. Members of Parliament did not like this suggestion very much, for they had been accustomed to having their letters carried free, and they did not want to pay a penny. But business men supported Rowland Hill, for they saw how good it would be for trade, and ordinary people were glad of the chance of being able to write to their friends more often. So with their backing Rowland Hill was able to get a Bill passed through Parliament introducing the Penny Post in 1840.

But, you say, we cannot send a letter to-day for a penny. No, but we could do so till the Great War. Then the Government raised the charge for a letter to three-halfpence and for a postcard to a penny. But some day we hope we shall go back to penny stamps for letters and halfpenny stamps for postcards, just as we hope that the charge for telegrams and the telephone, which are also controlled by the Post Office, will go down. For one of the best things we can have is a cheap system of communication. It helps us to gain knowledge and wealth, and brings happiness and interest into our lives.



The mail coach carried the letters in grandfather's day.

The first men we know about lived with their families in caves as far away from one another as they could. To-day we live in houses next door to one another, in towns and villages, and we are not afraid, as the cave people were, that our neighbours will kill or injure us, or steal our goods.


BY AIR
ROYAL MAIL
SERVICE FROM AUSTRALIA
BY AIR MAIL
COMMONWEALTH OF AUSTRALIA
ENGLAND
FIRST OFFICIAL AIR MAIL
MELBOURNE
DARWIN
QANTAS
SINGAPORE
RANGOON
CALCUTTA
IMPERIAL AIRWAYS LTD
LONDON

Letters from Australia fly swiftly to us to-day by air mail. This one came by the first official air-mail flight, in April, 1931.

Why has this change come about? Partly because there are many things we can enjoy with the help of other people that we could not have without them. The cave man could not have a newspaper because there was no news to put in it. He could not play cricket because there were not twenty-two people to make the sides. And partly because people have learnt how to make and obey rules for living together in peace and comfort. This is what we mean by the word government.

How has this change come about? That is a long story going back thousands of years. In that time people have tried many different ways of governing themselves. The earliest form of government was by the head of the tribe. A tribe was a large number of people all related to one another, fathers and mothers, brothers and sisters, uncles and aunts and cousins. The chieftain of the tribe was the father of his big family. He managed all the affairs of the tribe, and led the men in battle if they had to fight against their enemies. Everybody obeyed his orders and he punished people who did wrong.

BY AIR MAIL
PAR AVION
THIS LETTER
AUSTRALIA TO ENGLAND
BY THE
FIRST
ALL-AUSTRALIAN
AIR MAIL
SERVICE, 1931
AUSTRALIAN NATIONAL
AIRWAYS LIMITED
CHRISTMAS GREETINGS FROM AUSTRALIA

Modern correspondence has little chance of loitering on the way. This envelope travelled by the first all-Australian air mail, in November, 1931.

Then people began to live in towns, or cities, as they always called them in those days. Sometimes the city was ruled by a king; sometimes the people governed themselves. They chose one or more men to manage their affairs. The magistrates, as they were called, had a council of wise men to advise them, and at times all the citizens met together to decide important matters, such as whether they should go to war with another city. This kind of government is called a democracy, a term which comes from two Greek words meaning people and rule. The word comes from the Greek because it was among the Greek cities that government by the people first began. Four hundred years before Christ, Athens was the most democratic city we know.

Another name for a government of this kind is a republic. This word comes from two Latin words, meaning a thing belonging to the people. It was the name used by the people of Rome for their city for five hundred years.

Another form of government in ancient times was an empire. This means the rule of one man over a large country. He was sometimes called king and sometimes emperor. There were many ancient empires—Assyria, Egypt, Persia, and greatest of all, Rome, which gave up the republican form of government just before Christ was born. Because one man could not rule the whole of a large country himself, he divided it into provinces, and appointed governors to rule each province for him. They carried out his orders and obeyed him in everything. Except in the Roman Empire, the people had no voice in the management of their affairs. And even in the Roman Empire, all important matters were decided by the Emperor. This kind of rule is known as Autocracy, and is not in use in the great nations to-day.

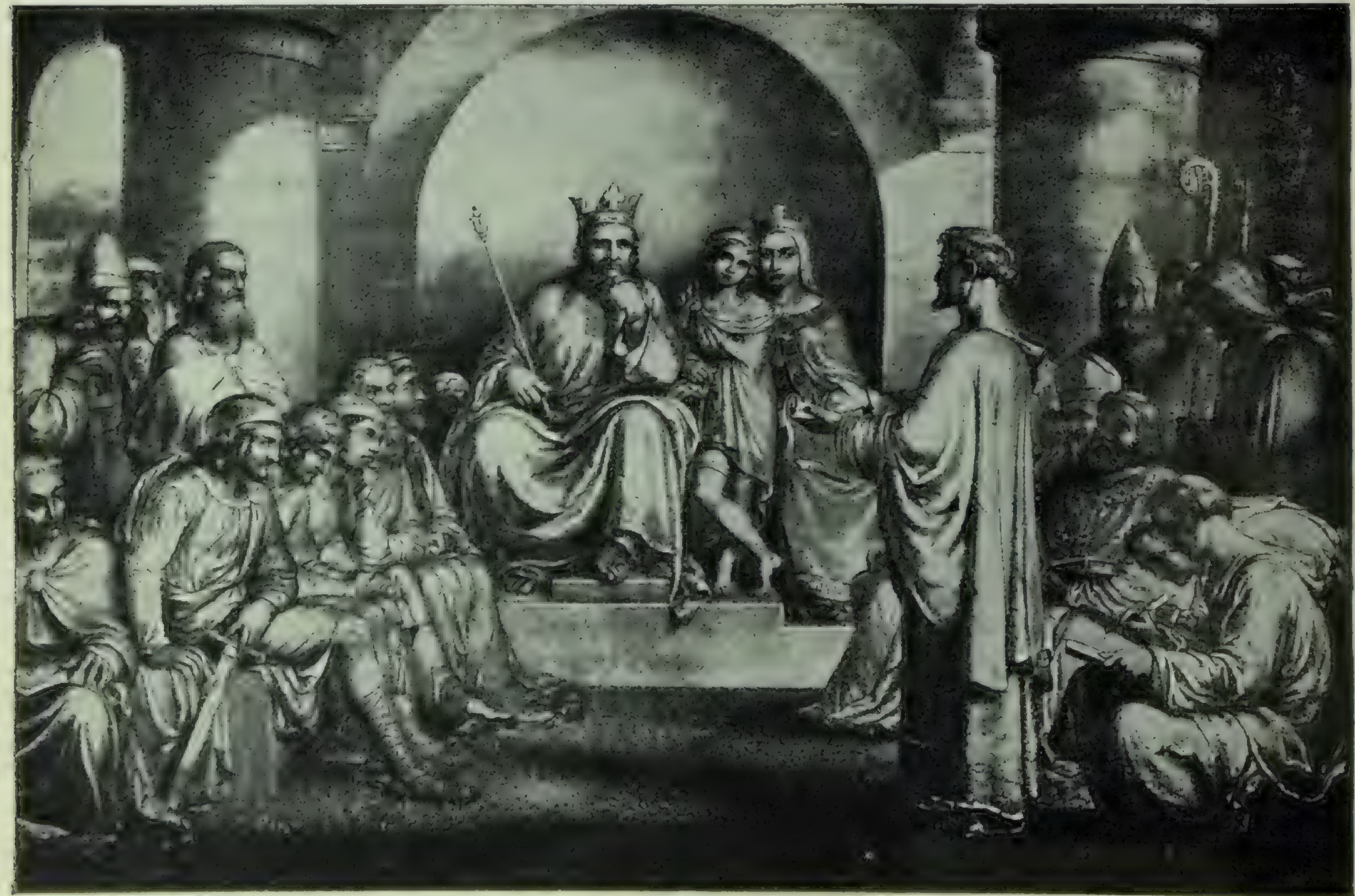
To-day almost all the countries of the world are democracies. The ruler may be called Emperor, as King George V. is when he is thought of as the ruler of all the lands within the British Empire, or he may be King as we call George V. when we think of him only as ruler of the United Kingdom of Great Britain and Ireland. More often to-day the ruler is called President, as in France, Germany and the United States of America, and the country is called a republic. He rules in accordance with the will of his people, which is expressed in an assembly called Parliament, Congress, or some name meaning the same thing.

Newspapers are always telling us about the doings of Parliament, about how they pass the laws that we must obey and divide the taxes we must pay. They are always telling us too about the meetings of the Cabinet, and the words and actions of the King's ministers. We are all so used to this that we do not think it at all wonderful that the affairs of a country in which so many people live, which produces so many things people need, and which plays an important part in the world, should be managed by a few men and an assembly which meets chiefly, it seems, to talk. Yet people of other countries have thought it so wonderful that they have copied it. That is why our Parliament is often called the Mother of Parliaments.

WHY ARE WE RULED BY PARLIAMENT?

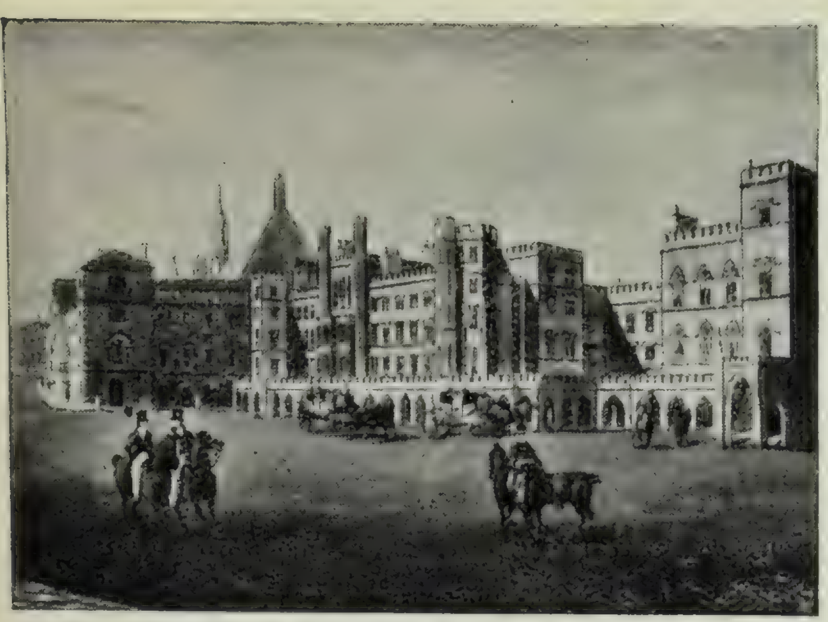
LONG ago, when the English people first came to this little island, they settled in tribes, governed by chieftains. Then the chieftains took the name of kings, and the part of the country in which each tribe dwelt became a kingdom. At one time there were seven such kingdoms in England. Then one kingdom, Wessex, became more powerful than the others, and the King of Wessex became the King of all England. He had no Parliament, though he had a council of wise men, called his *witan*, to help him.

When William the Norman conquered England, he ruled the country autocratically like the English kings, and his council was called the Great Council. This way of governing the land went on for about two hundred years. Then the first Parliament met. It was not called together by the king, but by a great noble, Simon de Montfort, who was quarrelling

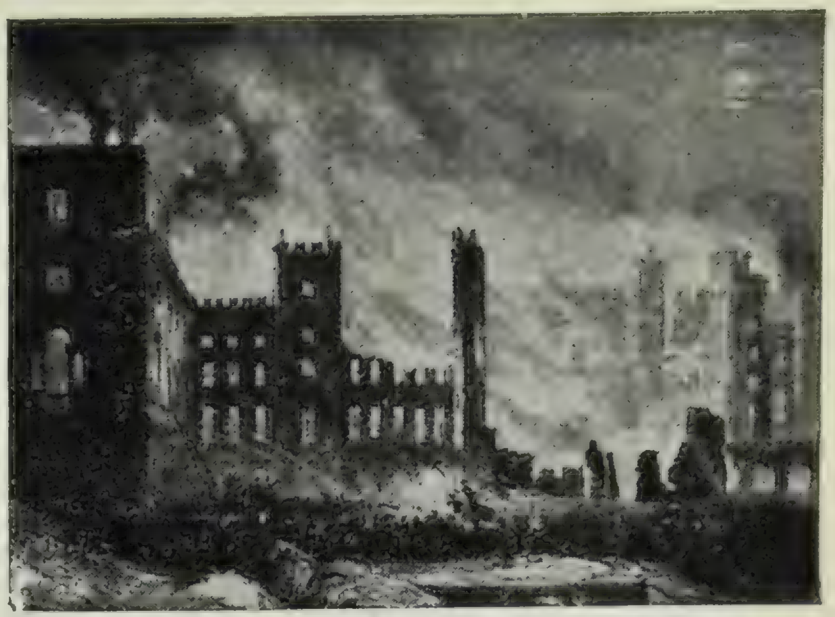


King Alfred summoned his leaders to council. This *Witan*, or meeting of wise men, was an early kind of Parliament.

THE HOME OF OUR LAWS: THE OLD AND NEW

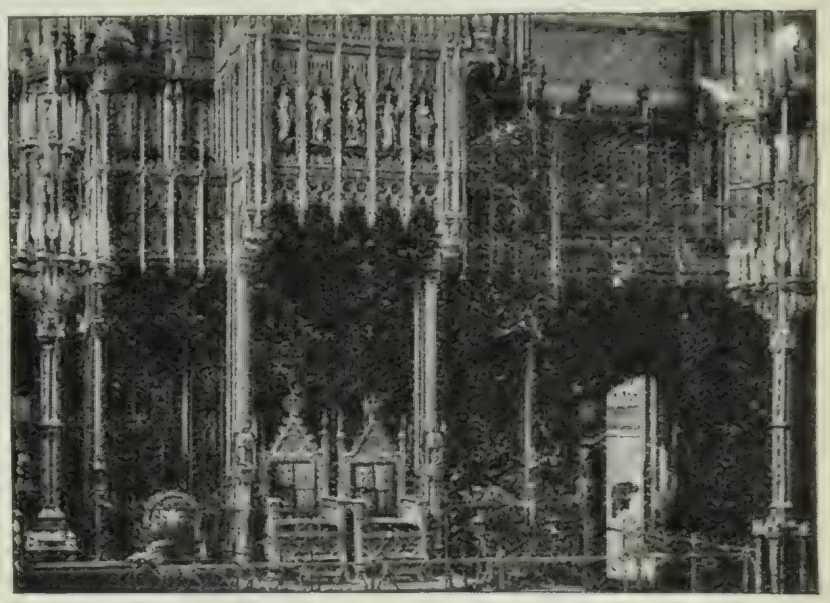


A glimpse of the old Houses of Parliament as they were in the days when Queen Victoria was a girl.



They were destroyed by fire in October, 1834, three years before Victoria was crowned queen.

The King and Queen proceed in a gilded coach, like the one in which Cinderella went to the ball, to open Parliament.



In the House of Lords are twin thrones for their Majesties, where they sit in state at the opening of Parliament.

The stately St. Stephen's Hall in the Houses of Parliament is lined with many beautiful statues and paintings.

Not far from the Houses of Parliament is No. 10 Downing Street, the London house of the Prime Minister.

with Henry III. and wanted people to support him. He called together the great nobles who were on his side, and because the country was too big for all the people who supported him to come together, he told the people of each town to meet together and choose two men to represent them—that is, to tell him what they thought. In the same way the people of the counties were to meet together and send two people to represent them. This ingenious way of finding out what people think has been followed ever since. We do just the same thing to-day when we vote for members of Parliament, though we do not all meet together and call out the name of the man we want to represent us. We have polling stations and ballot papers to-day, but this is only another and more careful way of choosing people to represent us in Parliament.

PARLIAMENT BECOMES POPULAR, AND LAWS ARE DISCUSSED BY THE PEOPLE.

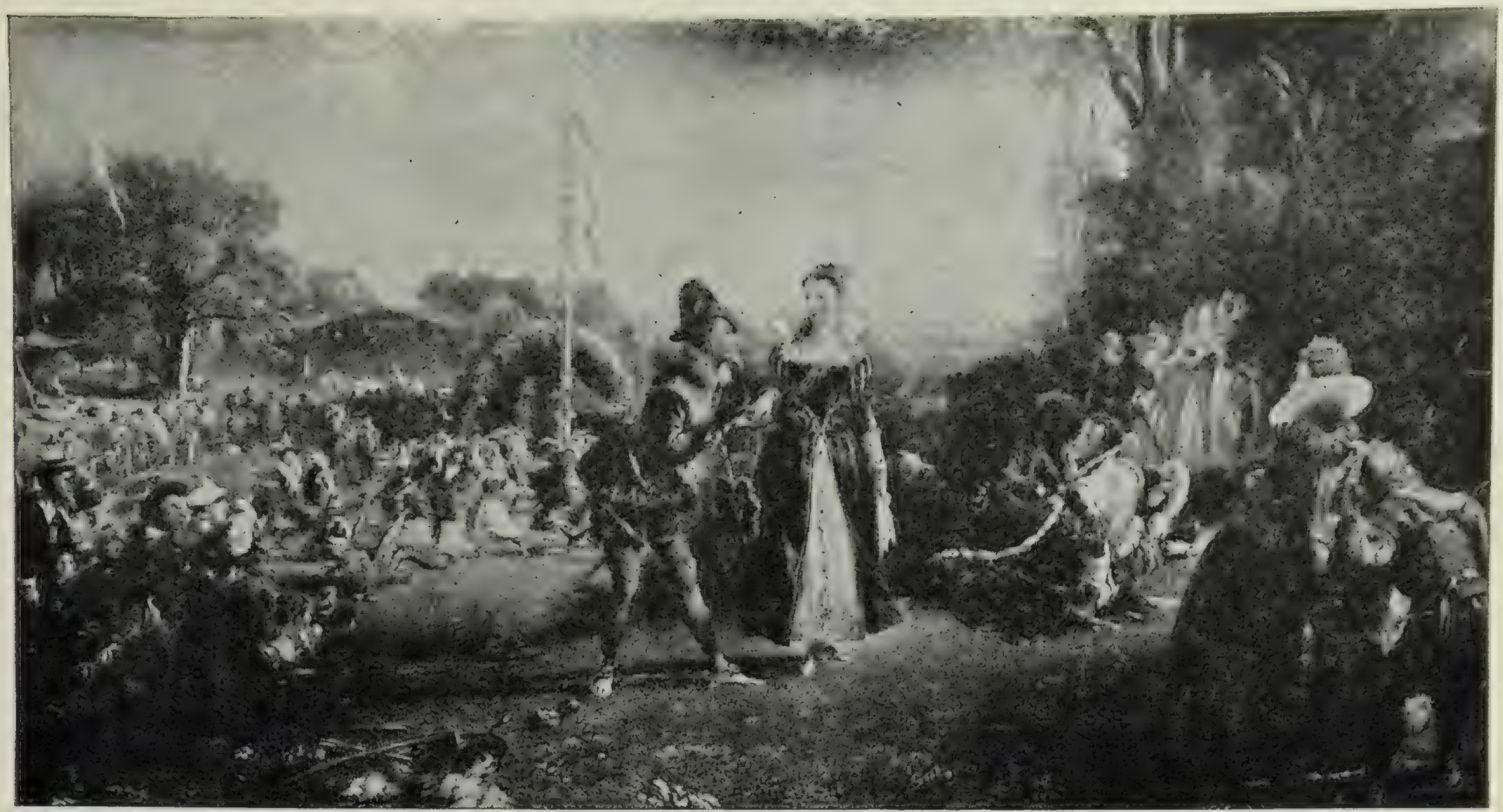
The next king of England, Edward I., saw what a good idea Simon de Montfort's was, so he called Parliaments also. He called them chiefly to agree with him what taxes should be raised to carry on the government of the country. They did not make laws then; the king still did this. At first, too, there was no House of Lords and House of Commons. All the members of Parliament met together in Westminster Hall, which still forms part of the Houses of Parliament. As time went on Parliament took the form it has at present. It was divided into two houses, meeting in different places. It also began to help the king to make laws, and to discuss all matters of importance regarding the affairs of the country.

HOW THE BLOODLESS REVOLUTION GAVE POWER TO PARLIAMENT.

Parliament was not able to gain all the powers it has to-day without many struggles, for the kings did not want to give up all their powers to Parliament. There was one great struggle which took place in the seventeenth century between Charles I. and Parliament. Eventually it ended in civil war and the execution of the king. When Charles II., his son, came to the throne, he was too wise to try to take away the powers Parliament had gained. His brother, James II., who was not as clever as he, had another struggle with Parliament, but Parliament got its way this time without having to go to war with the king. Instead it deposed the king, and chose another who would rule according to its wishes. Since the time of this struggle, the Bloodless Revolution, as it is called, Parliament has managed the affairs of the country. The king still rules, but he follows the advice of his ministers, who carry out the wishes of Parliament. And since Parliament is made up of men and women chosen by the people, we say that the people of England rule themselves, and that our country is a democracy.

Westminster Abbey and the Houses of Parliament as seen from the air. Westminster Bridge spans the Thames behind Big Ben, the giant time-piece whose chimes are broadcast all over the country. [*Aerofilms*

RURAL REVELS IN THE MERRY MONTH OF MAY



On May Day, villagers held revels round the flower-decked Maypole, enjoying this holiday which was the gayest in the year. The girl who was chosen as Queen of the May was the most important figure on the village green, [*C. R. Leslie*

UP and down the length of England there exist several villages and small country towns whose custom it is to hold each year a number of village dances. These dances are now more or less ceremonial, but nevertheless they are exercises in which all the country youth take part, and they attract countless visitors who journey from the surrounding towns in order to witness them. Very graceful and pretty dances they are; and they acquire an added charm because of the fact that they are open-air dances. That is to say, they are not danced in any theatre or public hall, but they take place on the village green, or in the market square of the country town in which they are held.

THE QUEEN OF THE MAY REIGNS SUPREME ON THE VILLAGE GREEN.

Such dances as these are the celebrated Floral dances of Cornwall, the Mayday dances of rural Cheshire and Derbyshire, the village folk dances of Essex, Kent and Surrey, and many others of a similar character. People like these open-air dances, because they are so youthful, fresh, and charming, and when such ceremonial dances are held on stated dates the number of people who assemble to witness them is very large indeed.

Particularly is this the case with the famous Mayday dances which are annually held in the old-world Cheshire village of Knutsford. Here the inhabitants of the district celebrate the first of May in the traditional old English fashion. A Maypole is set up on the village green, a May Queen is selected from amongst the village community and on the ceremonial day she is surrounded by a troop of village dancers who pay homage to her with various gifts, and who crown her as Queen of the May under the village Maypole. Then follows a display of country dancing in which nearly all the villagers, old and young, take part.

OUR LIGHT-HEARTED, LIGHT-FOOTED ANCESTORS FOUND JOY IN DANCING.

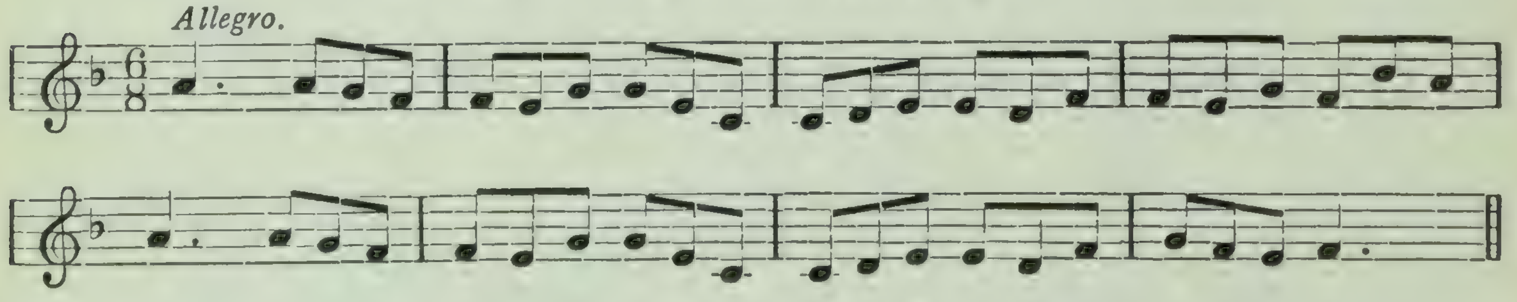
They hold high revels in these rural districts on the first of May and at various other times during the year, and if a village community is up-to-date enough to advertise its activities in this direction it is sure to attract a large number of people from the surrounding towns. Now, why should these old-fashioned country dances create such a deal of interest amongst townsfolk, we may ask? The reason is not difficult to find. It is because, despite the business and industrial occupations of the modern world, the English people still retain a place in their hearts for the old village amusements of rural England, and therefore most of us still like to witness the dances and to hear the simple lively tunes which delighted the hearts of our forefathers in the days gone by.

Dancing has always been a popular pastime in England, and a curious thing about the old English dances is that they have always borne a very great resemblance to the occupations in which the dancers were ordinarily engaged during the course of their everyday life. Not so the dances of other countries, however. For instance, at the time when our forefathers were all joining in their jolly old country dances, the French country people were dancing stately measures such as the *Pavan*, the ceremonial *Court Dance*, and the *Minuet*. The English people, however, liked to be at their ease in their dancing, and so they devised dances which were lively and which gave them plenty of opportunity to show off their high spirits and good cheer.

Then again, the English people brought their dances into their games, which was a thing the French country-folk very seldom did. You all remember, when you were young, how you played at various parties and family gatherings the games of "Hunt the Slipper," "Musical Chairs," "Blind Man's Buff," "Kiss in the Ring," and so on ? Well, all these family games are really remnants of old English dancing games, and they are so old that it is quite impossible to tell just how and when they originated.

Our forefathers, and their sons and daughters danced to the strains of village fiddlers and flute players. And such queer tunes these dance melodies were at first that one wonders how on earth the people managed to fit in their steps with the tunes. This, for instance, is one of the first dance tunes which was ever written down. It dates back as far as about A.D. 1300.

Dance Tune of 600 Years Ago.



Before this time the country folk danced "Egg-dances," and "Caroles." These were really old Saxon dances, the "Carole" being a slow dance which was performed at Christmas time. It has now, of course, developed into the Carol, first a slow tune but now a name given to other Christmas hymns and songs.

In Tudor times, that is, in the century in which Shakespeare and Queen Elizabeth lived and flourished, "Kissing Dances" were in extremely great popularity. There were few amusements for the people of olden days, unless they provided their own. Life was lived simply and the evenings and holidays were spent on village greens in laughter, dance and song. So great was the popularity of these kissing dances that they were from time to time introduced at Court, and they formed a great part of the revels which were held in the big country houses of the nobility and gentry.

The names of many of these dances are very queer. Here are some of them, including the majority of the most popular ones :

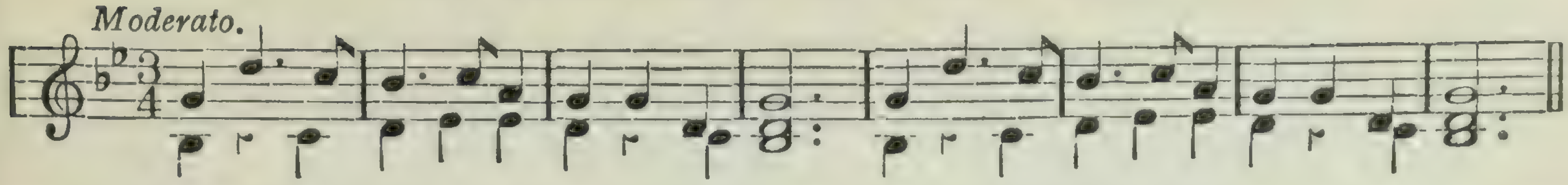
Omnium-gatherum ; Tolly-Polly ; All in a Garden Green ; Pudding Pies ; John, Come Kiss Me Now ; If All the World were Paper ; Lumps of Pudding ; Sweet Kate ; Once I loved a Maiden Fair ; Under and Over ; Hoite cum Toite ; and *Joan Sanderson, or the Cushion Dance.*

The last-named dance was an enormously popular one, and in some country districts it is still danced at the present day. You will find the music for this dance at the top of the next page.

Here is a description of the dance taken from an Old English book of dancing tunes entitled *The English Dancing Master* :—

"This dance is begun by a single person who, taking a cushion in his hand, dances about the room, and at the end of the tune they stop and sing, 'This dance it will no further go.' The musicians answer, 'I pray you, good sir, why say you so ?' *Man*—Because Joan Sanderson will not come too. *Musicians*—She must come too, and she shall come too, and she must come whether she will or no. Then he lays down the cushion before the woman, on which she kneels, and he kisses her, singing, 'Welcome, Joan Sanderson, welcome, welcome.' Then she rises, takes up the cushion, and both dance, singing : 'Prinkum, Prankum, is a fine dance, and shall we go dance it once again, and once again, and shall we go dance it once again.' Then, making a stop, the woman sings as before, 'This dance it will no further go.' *Musicians*—I pray you, good madame, why say you so ? *Woman*—Because John Sanderson will not

Joan Sanderson, or the Cushion Dance.



come too. *Musicians*—He must come too, and he shall come too, and he must come whether he will or no."

And so the dance went on. Everybody was in turn called into the ring Everybody was kissed, and therefore, we may imagine, everybody was satisfied.

A very old country dance tune is entitled *Greensleeves.* Queen Elizabeth danced to this tune. So, also, must Shakespeare have done, for he certainly knew the tune of *Greensleeves,* and in his play, *The Merry Wives of Windsor,* he makes old Falstaff utter the following exclamation :

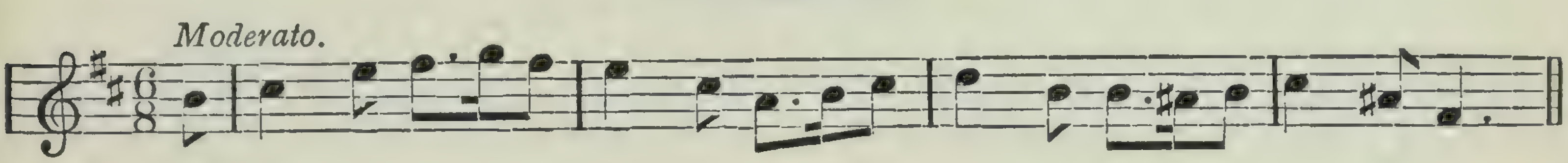
" Let the sky rain potatoes, let it thunder to the tune of *Greensleeves.*"

you will see that the tune can be repeated over and over again without coming to an end.

Packington's Pound, Stingo, or Oyle of Barley, Paul's Wharfe, and *Paul's Steeple,* are the names of other favourite and tuneful Rounds which were danced many years ago.

In our story of old English country dances we must not forget one of the best-known dances—the Morris dance. The Morris dance is still performed, and although it has now become more of a ceremonial dance than anything else, it still retains sufficient of its old English charm to enable us to realise exactly what it must have been like in the days when it was danced by everybody, young and old alike.

Greensleeves.



Greensleeves is a very lively tune. It is not out of date even now, and one of our best musicians, Gustav Holst, has included this delightful dance melody in one of his orchestral symphonies. Above is the first part of the tune, so you will be able to see for yourself just what it is like :

Another favourite form of dance in Old England was the *Round.* A *Round* was a dance in which an almost unlimited number of people could join, and there was no end to the melody, for, as soon as the musicians had got to the end of the tune, they started it all over again. In this way the dance went on and on until the dancers dropped out from sheer tiredness. *Sellinger's Round* is one of the best known of these dances. A portion of the melody is given below, and if you play it over

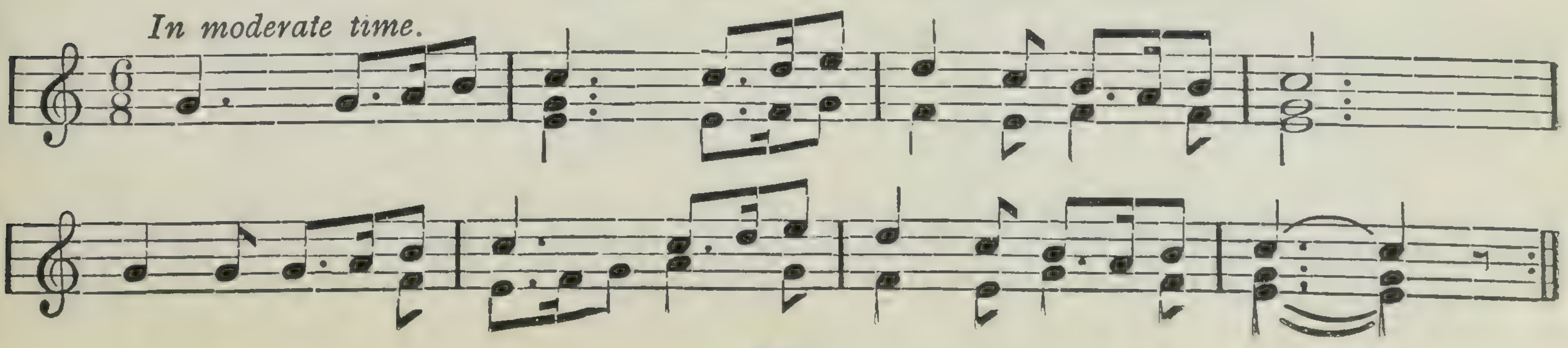
The Morris dance first became popular in England in the time of Edward III. The dance itself is said to have originated among the Moors and to have been brought over to England by John of Gaunt, who first witnessed it during his travels in Spain. Hence the name, "Morris," which is really a corruption of "Moorish."

The tunes to which the Morris dance was executed are very numerous. Here are some of them, the third tune being one that can often be heard in the country districts of Lancashire and Cheshire even at the present day.

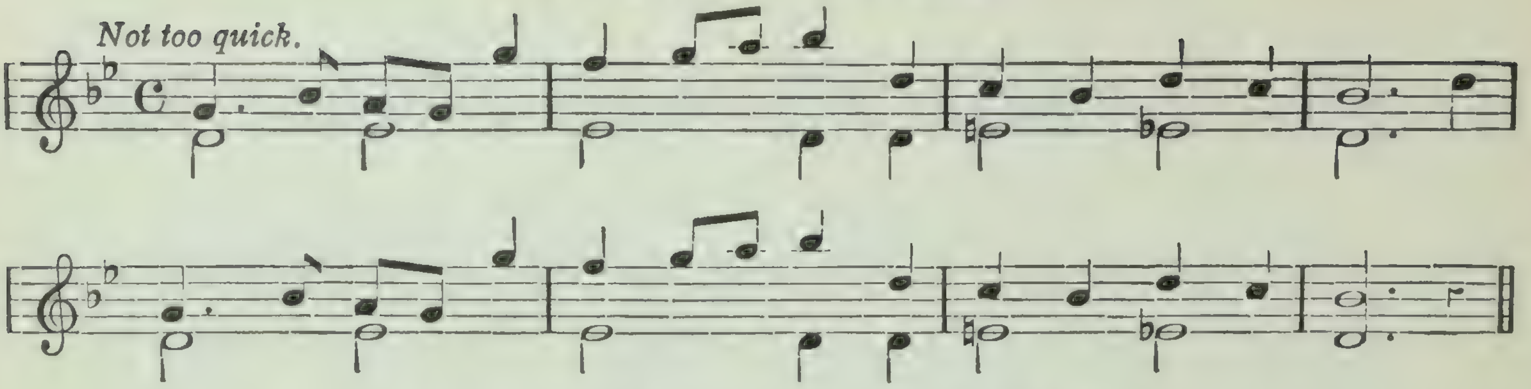
The tunes of *The College Hornpipe* and *The Girl I left Behind Me* were also adapted to Morris dances, although, strictly speaking, they were not composed for that purpose.

Morris dances, in the olden days, were

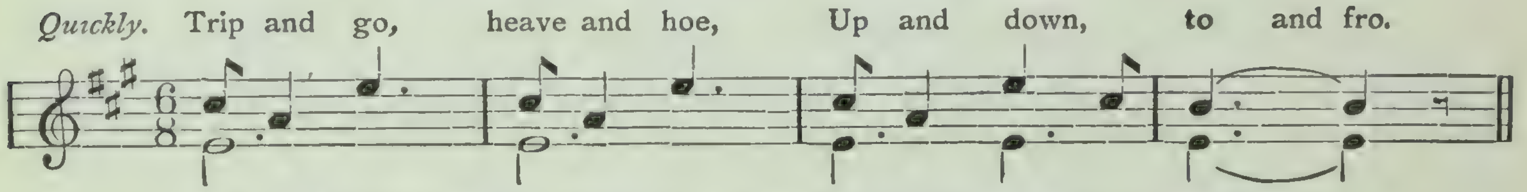
Sellinger's Round.



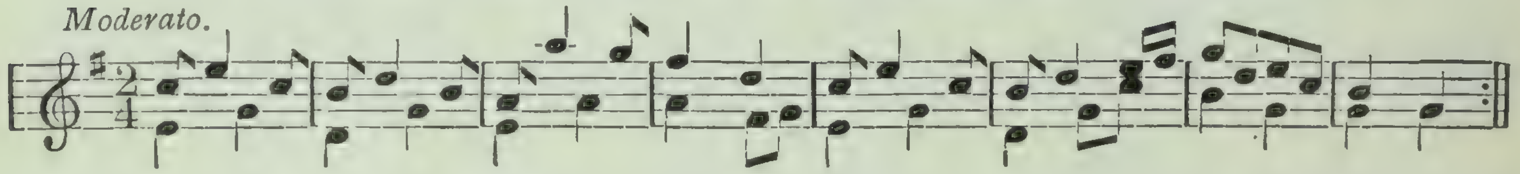
1. Early Morris Dance.



2. Morris Dance, "Trip and go."



3. Morris Dance Tune from Lancashire and Cheshire.



always danced round the village Maypole, and the performers dressed up in the guise of various national characters, particularly those of Robin Hood, Friar Tuck, Maid Marian, and the rest of the band of this national outlaw-hero. All the dancers wore bells at their knees, and one old writer, referring to these dances, says :—

" Sometimes the Morris dancers would come into the church with all their linen and scarves and antic dresses, and with Morris bells jingling at their legs."

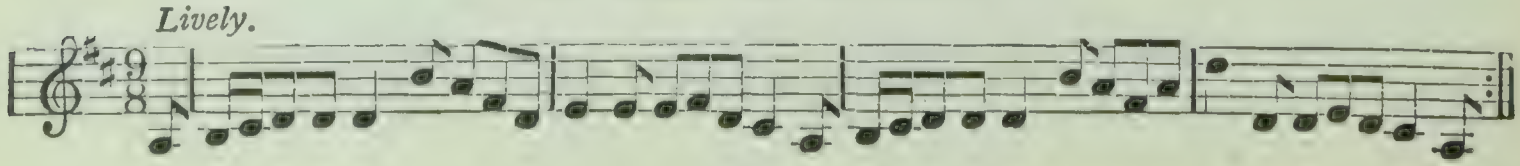
Nobody would think of dancing in a church nowadays, but in the days of Merrie England such things were not only done, but, generally speaking, they were usually approved of.

Among the other rural dances which were popular with our forefathers was the well-known *Sir Roger de Coverley*. This favourite dance is perhaps the only one remaining from the multitude of former dances which still finds a place in our modern dance programmes. *Sir Roger de Coverley* first began to be danced about the end of the seventeenth century, and, as a simple and lively dance measure, it has been a favourite ever since. The melody is taken from an old air, the origin of which is unknown.

Finally, among the old English dances, we have the *Quadrilles*. These came into fashion about the eighteenth century, during the period when England was rapidly waking up to commercialism and becoming transformed from an agricultural into a manufacturing and industrial nation. These seventeenth century *quadrilles* really represent the last of the purely English country dances, for, towards the latter end of this period, the rural population of England began to be broken up, and stately ballroom dancing, with its glittering artificialities, became the order of the day, or rather the night, among the townspeople of the country.

Such a state of affairs has persisted to the present day. Old English country dancing is no more. In our modern life there is no time for it. But nevertheless, when modern folk get a chance of hearing some of the old village dance tunes being played, and of witnessing the actual dances, they seize the opportunity because it appeals to some peculiar chord in their imagination which is still living and which retains inherited memories of those gay revels of Merrie England in days gone by.

Sir Roger de Coverley.



Graceful Lincoln Cathedral, perched on its hill, was for fifteen years under the loving charge of St. Hugh.

PEOPLE WHO DID BIG THINGS

I. SAINTLY BISHOP HUGH OF LINCOLN

THE great bell of the Carthusian monastery near Grenoble rang sharply and the prior, who was crossing the cloister, stopped to see what travellers might be abroad this black and stormy night. The porter unbarred the gates and there entered a knight, weary and travel-stained, leading by the hand a bright faced boy of eight years old.

" Sir prior," said the knight, " this is my son, Hugh. I bring him to you, for my castle is no place for a motherless bairn. Will you take him and bring him up to be a good and true man ? "

The prior looked thoughtfully at the boy. He was full young, he said to himself, for the strict rule, the long hours of silence and the loneliness and bareness of a monastery cell. Would he not long for the clank of arms in the castle courtyard, the song and feasting in the great hall, the cry of the falcon as the hunt set forth? Suddenly Hugh smiled fearlessly up at him, and the prior knew that he would not fail. He turned to the knight, " You must both rest here for the night," he said, " and to-morrow we will take Hugh into our care. He may lead a holy life within these walls."

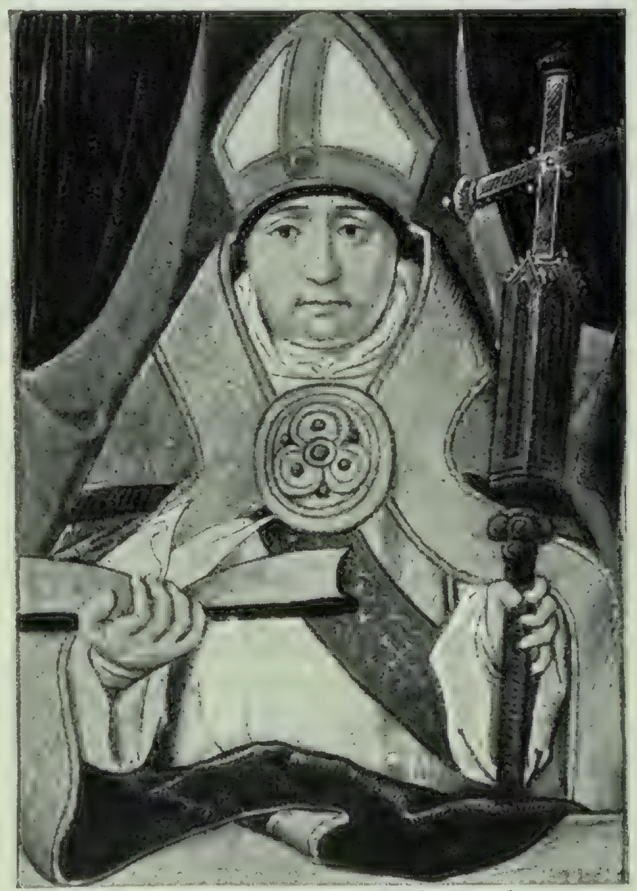
For ten years Hugh lived quietly in the monastery. He learnt to sing in the choir, and went to six services in the monastery church every day. When he grew older, he went to another in the middle of the night. He learnt to read the Latin in which nearly all the books of his time were written and to copy the books which were wearing out, for nobody knew about printing then. Sometimes he rode with a kindly old monk to the farmhouses and cottages on the monastery lands to collect the tenants' rent. Sometimes he watched the masons at work on the monastery buildings, and he learnt to handle their hammers and chisels so skilfully that they told him he would make a very good mason.

But Hugh wanted only to sing and pray in the monastery church and to work on his books in the quiet cloister. He was glad when his time as a novice (or beginner) ended and he could put on the white robe which all full Carthusian monks wore, and promise that all his life long he would obey the rules of the Order and give himself to the service of God.

When Hugh was nineteen he was sent to the head monastery of the Carthusian Order which was called La Grande Chartreuse. It was a big cold building on the snowy, pine-clad slopes of the Alps. Hugh grew to love the quiet and peace of the mountains and the stern, grave life of the monks, which was stricter than that of the monastery at Grenoble. There he would have liked to stay forever, serving in the church and monastery and praying and reading alone in his cell.

But he was not to remain there long. For Henry II. of England had built a new abbey at Witham in Somerset. It was to be a monastery of the Carthusian Order, and so the king sent to La Grand Chartreuse to ask for a man to rule it. In the Chapter, as the meeting of the monks was called, it was decided that no man in the great monastery was fitter for this work than Brother Hugh. Hugh did not want to go, but he had promised to obey, so soon after this he went to England to be Abbot of Witham.

At first the monks of Witham disliked their foreign abbot, but they soon grew to love him. He and they set themselves to build their church with their own hands and to make their abbey beautiful for the glory of God. The abbey had a walled garden in which Hugh often walked deep in thought, and then the great swan would stalk beside him and the birds would come close to him as to a friend.


St. Hugh of Lincoln, from a sixteenth century Flemish manuscript.

THE MAN WHO TREATED THE KING AS AN EQUAL —AND WAS MADE A FAVOURITE.

Henry II. took a great liking to Hugh, perhaps because the gentle abbot was one of the few men who were not afraid of him. Hugh treated kings as he treated all other men and told them fearlessly what he thought of them. There is a story that one day, as he was riding to dine with the king, he found a poor man dead by the roadside and stayed to read over him the service for the dead. The king sent a messenger to tell him he was waiting. " Say to him," said Hugh, " that it is better for the king to wait for his dinner than for this man to be kept from his rest."

The king thought too well of Hugh to let him stay long at Witham. When the Bishop of Lincoln died, Henry asked him to become the new bishop, and though Hugh would gladly have stayed in his quiet abbey, he did not refuse, for he felt that God had called him to this higher and harder place.

THE FEARLESS BISHOP WHO EARNED THE TITLE OF SAINT.

Bishop Hugh had ruled thirteen years in Lincoln when Richard the Lion Heart, who followed King Henry on the throne, demanded men and money of the English bishops and barons for his wars in France. In the council which they held to decide what answer they should give, Hugh rose up and said: " Ye know well, my lords, that I am a stranger in this land . . . But when Our Lady's church at Lincoln was given into my unskilled hands, I set about learning what its rights and burdens were. . . . We must furnish knights for the king's service in England, but not for service abroad. I will go back at once to my old hermit's life rather than lay fresh burdens on this bishopric committed to my charge."

When Richard was killed by the arrow from the walls of Chaluz, it was Hugh who laid him beside his father at Font-Evraud. The good bishop's heart was heavy, for he feared for the land of his adoption and for the Church he loved under the rule of Richard's false and treacherous brother John. But he did not live to see the evils the king brought upon his people, nor did he ever go back to Lincoln to see the choir of the cathedral which his friend, Geoffrey Noyers, the master builder, was finishing. He died on November 17th in the year 1200, with the words of the beautiful hymn that is still sung in the English Church ringing in his ears.

" Lord, now lettest thou thy servant depart
in peace."

Later people called him St. Hugh of Lincoln. His life fitted well with the motto he had chosen for himself, the Latin word *Fidelitas*, which means in English " Faith."

IN THE DAYS OF GOOD QUEEN BESS

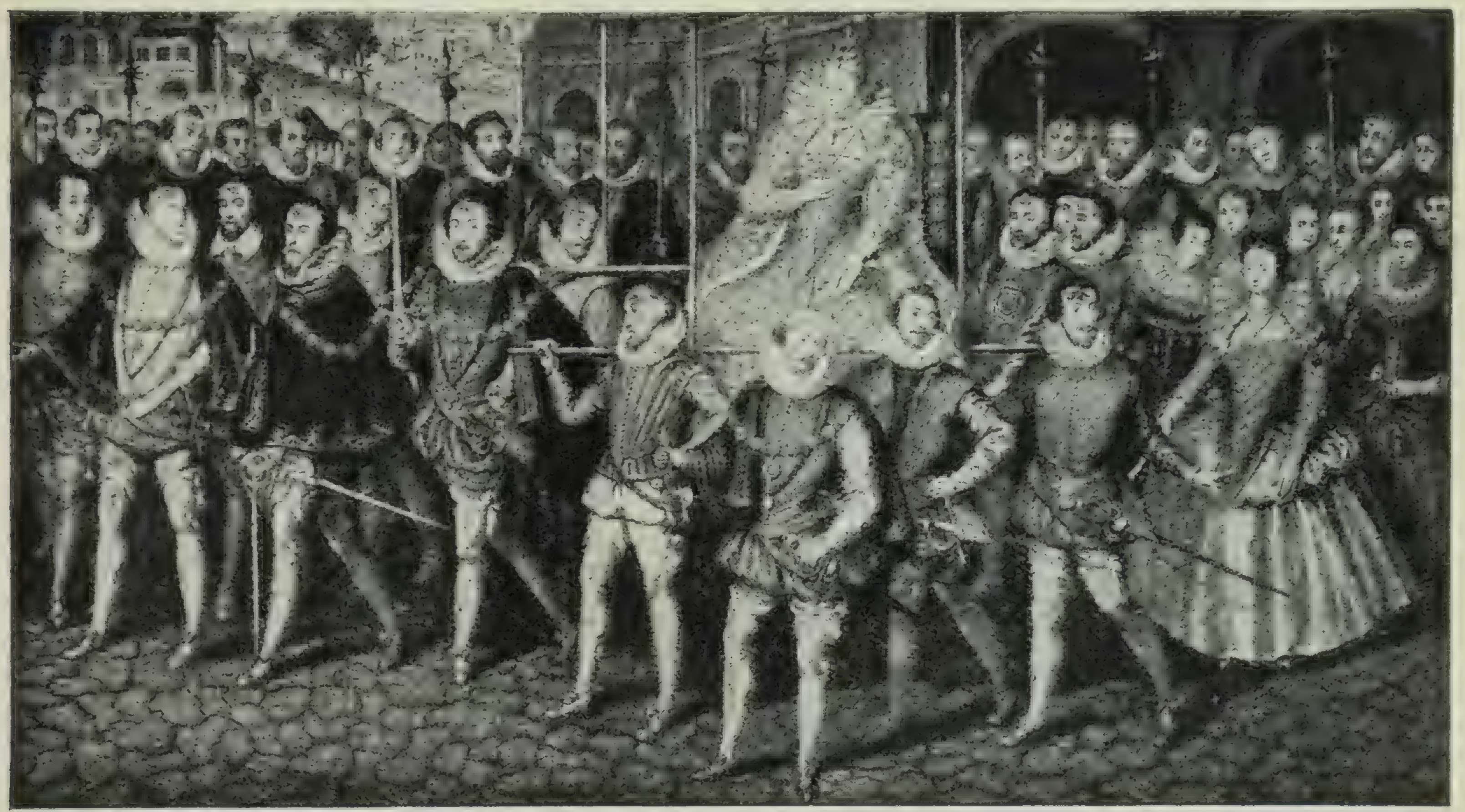
DUSK was falling on a chill November afternoon in the year 1558. In the great hall of Hatfield House a log fire burned cheerily, casting a warm glow on the oak panelling around the fireplace. At intervals on the walls tall candles in carved iron sconces sent their flickering gleams into the shadows at the farther end of the long room.

In a high-backed chair beside the fire sat the Lady Elizabeth, Queen of England. By her side lay a book of Cicero's *Orations*, which she was never tired of reading, for had not Master Roger Ascham taught her to love the beautiful Latin sentences in her girlhood's days in this same great hall at Hatfield? But she was not reading now; she sat looking thoughtfully into the fire, which threw a ruddy light on her long pale pointed face and made redder still her mass of coppery-coloured hair.

It was but two days ago that her sister Mary had died and thrust the burden of queenship upon her. A burden indeed, for England was poor, at war without and in a turmoil of discontent and unrest within. But—and Elizabeth raised her head with a little proud gesture—a trust also, a work to be done for the country and the people that she loved. Peace and plenty and prosperity must be brought again to England, and, with God's grace, she, Elizabeth, would do it. Was she not Elizabeth Tudor, daughter of bluff King Hal? Had she not Sir William Cecil, faithful and honest and wise, to help her?

To-morrow she would meet the members of her Council. She thought over the words she would say to them, "I desire you all my Lords, chiefly you of the nobility, everyone in his degree and power, to be assistant unto me; that I with my ruling and you with your service may make a good account to Almighty God, and leave some comfort to our posterity in earth."

In the spring of 1581 a little ship was drawn up on shore at Deptford in the Thames estuary. It was the *Pelican*, in which Master Francis Drake had sailed into Plymouth Sound six months ago, with a hold full of Spanish treasure, and a wonderful story of how he had sailed right round the world.

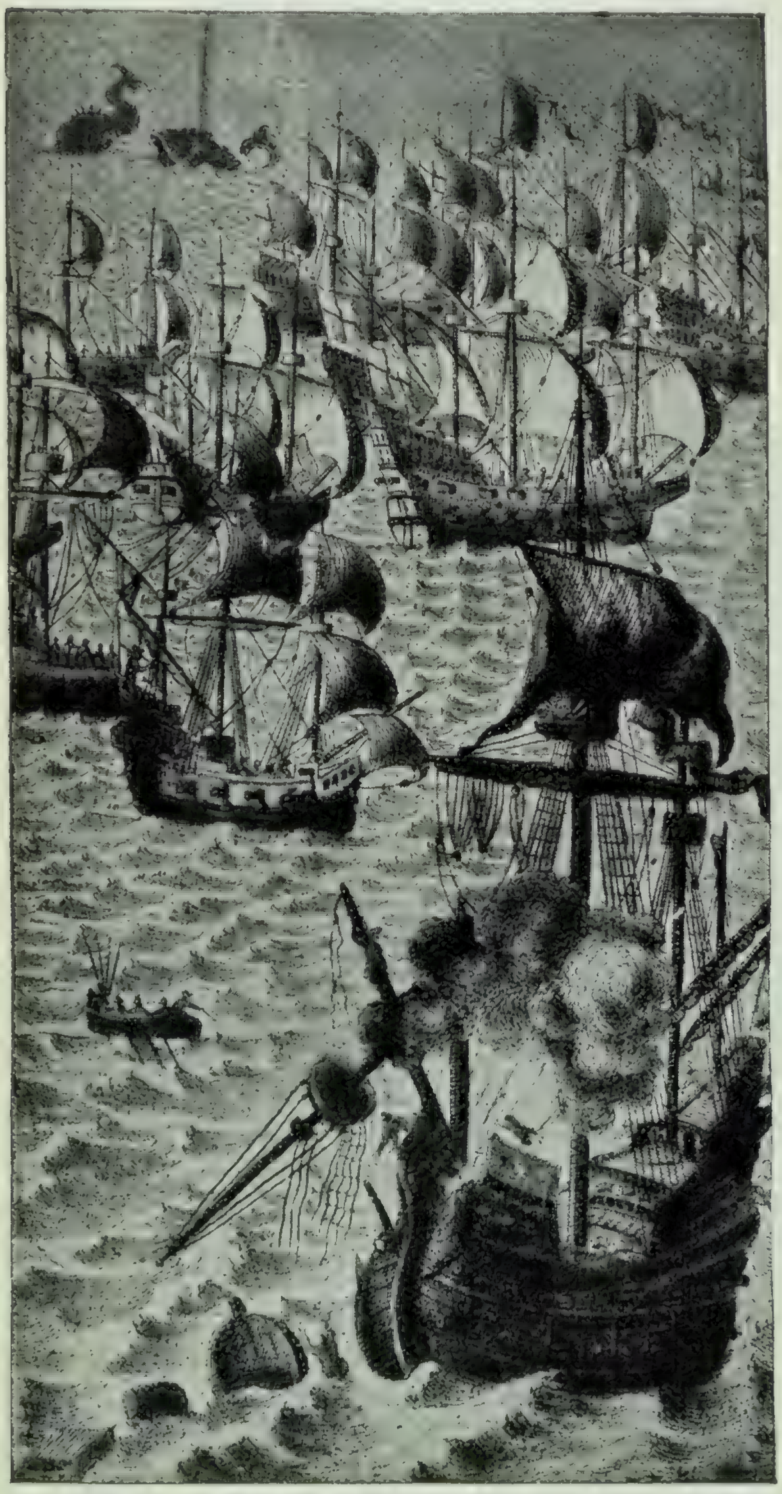


Queen Elizabeth, in all her dignity and splendour, heads a picturesque procession of her ladies and courtiers.

To-day the little vessel was gaily decorated with pennons and streamers and garlands of flowers. For there was to be a great banquet on board, with a goodly company of lords and ladies, and the Queen herself had graciously consented to be present to show her favour to the daring sailor who had ventured boldly into Spanish waters and proclaimed England's right to share in the riches of the New World.

The good men of Deptford, with their wives and children, were gathered on the shore and the boatmen on the river had a busy time bringing citizens from London to swell the throng. The buzz of talk was incessant.

Each man told his neighbour what he had heard about the exploits of Drake, how he had braved the winds and storms of the Atlantic and the frost and snow of the Magellan Straits. With bated breath the tale was told of the treasure he had taken from the Spaniards, a great gold crucifix set with emeralds as large as pigeons eggs, pearls and diamonds, wedges of gold and bars of silver. It was no wonder the Spanish king fumed and threatened war on England. And it was a good thing that Drake had not tried to return the way he had come, but had sailed across the Pacific Ocean and home by the Cape of Good Hope, though it had taken him so long that men had given him up for lost.


The vessels of the great Spanish Armada, sent out to fight the English in 1588, were badly beaten by the smaller, yet more nimble English ships of the Line.

Then one day the queen came to see Drake. Men shouted themselves hoarse as she passed by in her litter, borne by gallant gentlemen, and escorted by her courtiers and ladies all dressed in gay silks and velvets. More resplendent than all was Elizabeth herself, in her golden satin dress sewn with pearls, and ruff of priceless lace. Jewels gleamed on her neck and in her red hair, and her long white hands were loaded with rings. People said that the Queen was very extravagant and spent a great deal of money on her clothes, but what matter ? They loved to see her in her finery and she showed herself among them with right good will. And so long as there were men like Francis Drake, one could always get treasure from the New World.

THE SEA-ROVER WHOSE DARING EARNED THE QUEEN'S ADMIRATION.

The queen passed on board the vessel and Master Francis Drake came forward to welcome her. Those nearest to the shore saw her take a sword from one of her courtiers and motion him to kneel. Sir Francis Drake ! Here was honour indeed for a sea-rover, a plain Devon man who had nought but his own daring to commend him. The crowd cheered again and again for Drake and the queen—their Good Queen Bess, whose courage was as high as any man's and whose craft and untiring will had kept England safe from her enemies, even from the might of Spain herself.

There were anxious hearts in England in July, 1588, for the danger that had long threatened the land was nigh at hand. Philip of Spain was sending his great Armada to invade England and overthrow the Protestant faith. All along the southern coast men watched anxiously for the great galleons bearing the soldiers of Spain ; in London men went about gravely and watched with satisfaction the trained bands who poured through the city on their way to Tilbury, where the queen was to review them and where they were to await news of the Armada.

THE MAN WHO CALMLY FINISHED HIS GAME OF BOWLS IN SIGHT OF THE ENEMY.

In Plymouth lay Sir Francis Drake and Lord Howard of Effingham with the gallant little English fleet which the queen and her loyal subjects had fitted out to meet the Spaniard. Drake was playing bowls when the news was brought to him that the Armada was in sight.

" They must wait their turn," said he, " let us finish the game."

Up the Channel sailed the great Spanish ships: and the little English vessels, slipping out from the port behind, were soon hard upon their heels. For nine days they followed up the Spaniards, moving swiftly, delivering a rapid broadside into the enemy's fleet and disappearing before they could be punished in return. Always they kept the Spaniards away from the English shore. When the Spanish vessels took refuge in Calais harbour, Drake sent fireships and drove them out. On the twelfth day the Spanish commander tried to fight, but his gunners and sailors were no match for the English. Defeated, he tried to escape by sailing round Scotland and Ireland, but a great storm sprang up and nineteen ships were wrecked on the coast of Ireland. In a five-mile walk a man counted eleven hundred bodies of Spaniards.

"God blew with his winds and they were scattered." Englishmen thought they owed their salvation to God and, under God, their queen. The plaudits of the crowd were deafening when Elizabeth went in state to St. Paul's to give thanks for England's deliverance. For the might of Spain was utterly gone, and England was now "Mistress of the Seas."

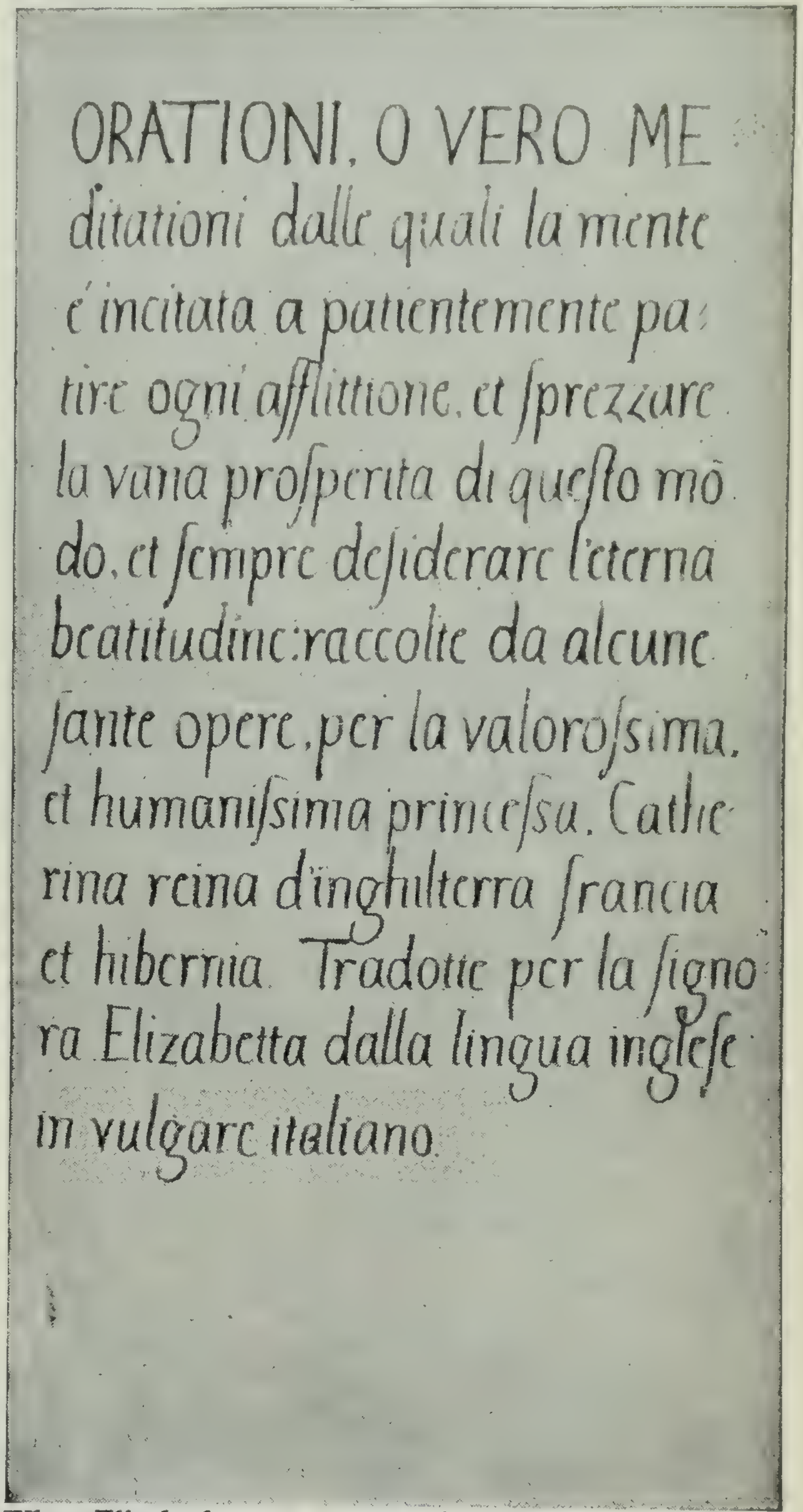
THE REIGN OF GOOD QUEEN BESS COMES TO AN END.

In her palace of Richmond Queen Elizabeth was dying. The cold light of a March day fell full on her face as she sat propped up with pillows in a great chair, showing all the wrinkles of age and the lines that care had marked upon it. Her Council stood round her waiting for her to speak. They knew not who was to succeed her, for Elizabeth had never married, and she had no near relations.

Suddenly the queen opened her eyes. Bending down the Chief Secretary said gently, "Madam, we would know your good pleasure regarding your successor." He waited, but there was no answer. Again he spoke, "Is it your Majesty's will that the high and noble prince, James Stuart, son of Mary, that was Queen of Scots, shall reign also in England? He is your Majesty's nearest heir." For a moment a fierce light gleamed in Elizabeth's eyes.

LONDON MOURNS FOR THE QUEEN, WHOM IT HELD IN REVERENCE AND AWE.

The name recalled memories of twenty years of plots and conspiracies against her throne and her life, which had only come to an end with her reluctant consent to the beheading of her cousin. Then the light faded. Watching anxiously, her counsellors saw her raise her hand in what they took to be a sign of assent. Patiently they waited, hoping for some words to confirm it. But none came. The queen lay still and silent, and with bowed heads they silently withdrew.



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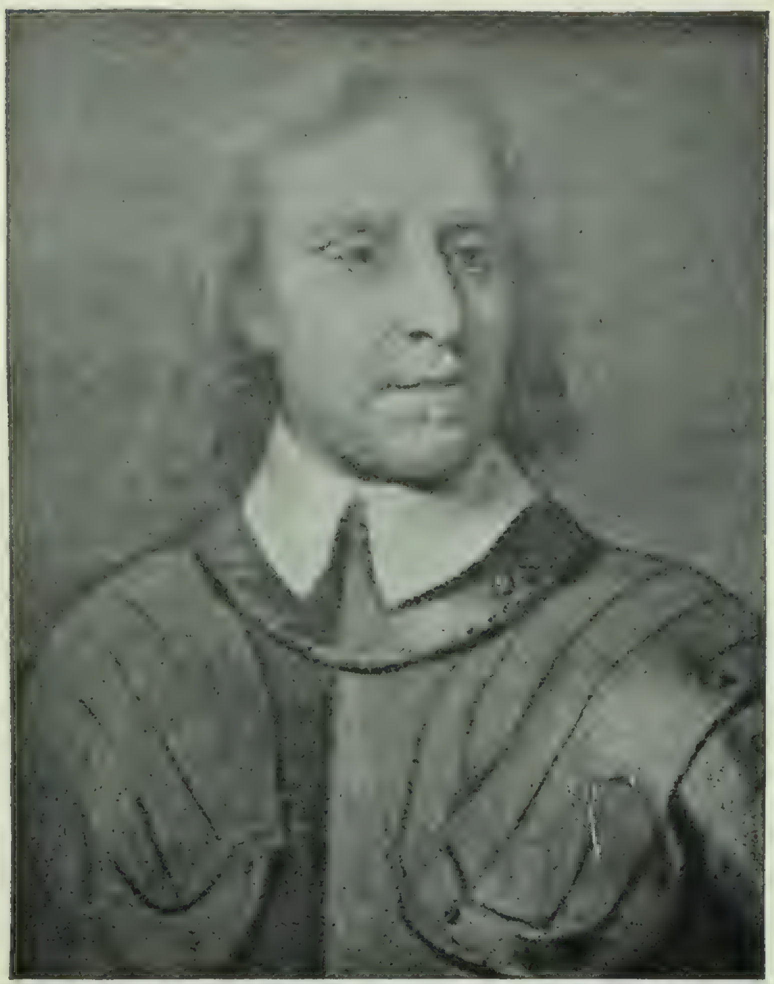
ditationi dalle quali la mente
é incitata a patientemente pa
tire ogni afflittione, et ſprezzare
la vana proſperita di queſto mō
do, et ſempre deſiderare l'eterna
beatitudine: raccolte da alcune
ſante opere, per la valoroſsima.
et humaniſsima princeſsa. Cathe
rina reina d'inghilterra ſrancia
et hibernia. Tradotte per la ſigno
ra Elizabetta dalla lingua ingleſe
in vulgare italiano.

When Elizabeth was a young girl she wrote this prayer in Italian. The style is known as Italic.

[*British Museum.*

Next morning the bells in London tolled for the queen. Forty-five years of work for England was ended and the reign of James Stuart had begun. Some men welcomed it, for Elizabeth had grown irritable and domineering of late, but others, remembering the stormy days of 1558, sighed for the passing of a great ruler. They would not see her like again.

OLIVER CROMWELL—THE IRON-WILLED RULER



Oliver Cromwell. The Puritan leader of the Parliament against King Charles I. in the Civil War.
[*National Portrait Gallery*

IF you ask your father who Oliver Cromwell was, he will probably tell you that he was a great statesman who was Lord Protector of England after Charles I. was executed in 1649. This is quite true, but Cromwell was also a soldier, though people often forget about it.

Oliver grew up with his six sisters in a quiet household in Huntingdon. His parents were Puritans, that is, people who did not believe in gay clothes and pleasures and amusements, but lived simply and seriously, and spent much time in prayer and reading the Bible. Both at home and at the grammar school to which he went Oliver learnt to know and love the Bible which he read in the beautiful Authorised Version that we still use to-day.

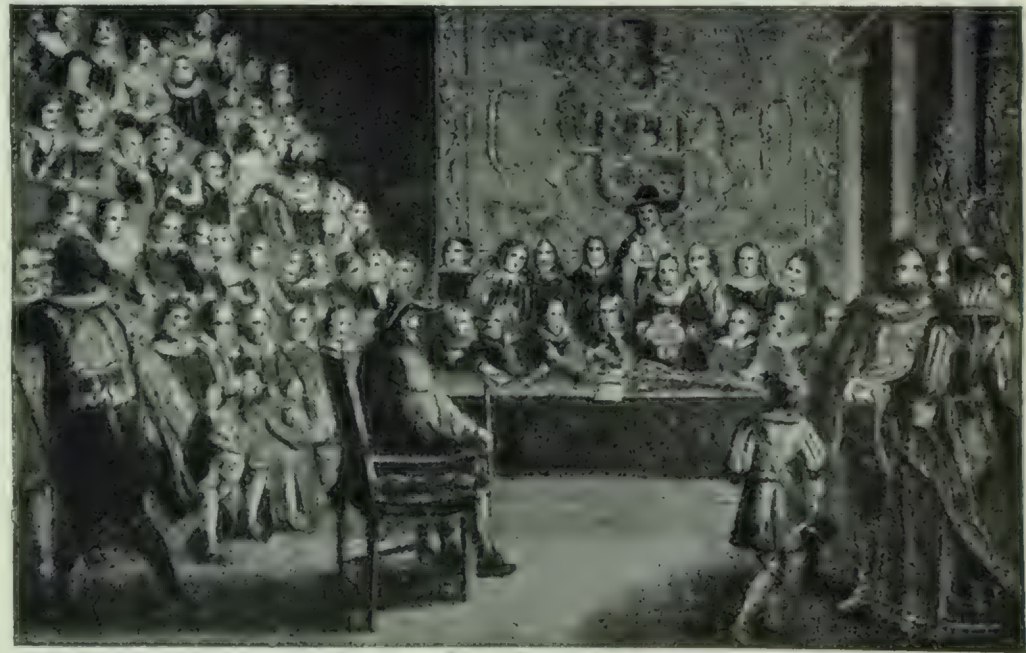
From his school he went to Cambridge University where he learnt enough Latin to talk it afterwards to foreigners who came to visit him when he was Lord Protector, and perhaps also some history, geography and mathematics. But he was better at boxing and football than as a scholar, for he was tall, strongly built and very brave.

Oliver's father died when he was eighteen, so he had to come home to take care of his mother and sisters and to look after the family property. In Huntingdon he became so well known and respected that his fellow citizens sent him as one of their members to the Parliament of 1628. At Westminster he stood in his plain cloth suit, hat in hand, with other members of the House of Commons, and listened to the speech of Charles I. when he opened Parliament.

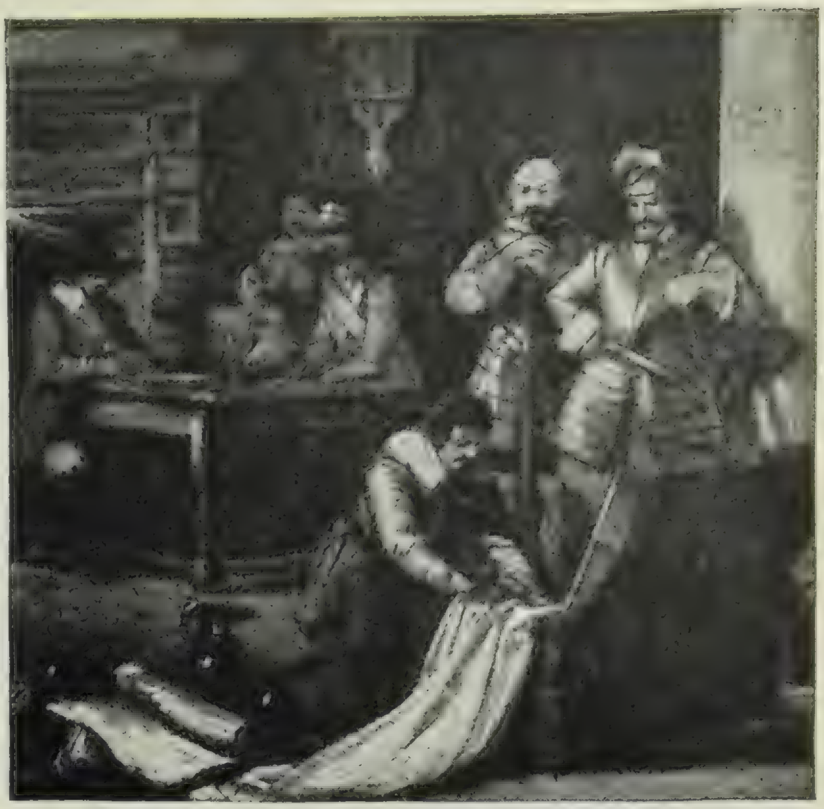
THE MAN WHO WAS THRASHED FOR FIGHTING A PRINCE.

Oliver smiled to himself as he looked at the handsome young king, surrounded by his courtiers in their bright satin and velvets with plumed hats, jewelled swords and collars of rich lace. For he remembered the day long ago when he had knocked the little prince down in a bout of fisticuffs in his uncle's garden at Hinchinbrook and had had a sound thrashing for his pains. Then his smile faded and an anxious frown took its place. For already it was rumoured that the king intended to rule as he pleased and not with the advice of his Parliament, and Oliver with his cousin, John Hampden, and his friend, John Pym, and many others, believed that the king should rule according to the will of the people. He foresaw that being a member of Parliament was not going to be easy.

Things turned out as Oliver expected. In that Parliament and in the next there were constant quarrels between the King and the members. Then Charles decided he would rule



A seventeenth century engraver has given us a peep at the trial of Charles I. The king, seated in the middle, is confronting his judges. [*British Museum* without a Parliament, so Oliver was able to go back to Huntingdon. Soon after this he bought an estate at St. Ives, and there he went to live with his wife and children, his mother and some of his sisters. As he rode about looking after his farms and fields, he would gather his labourers together and read the Bible and pray with them, so that they came to know and trust this man with the sharp voice and keen blue eyes, and were ready to follow him when war came in later years.



Cromwell's soldiers are here seen searching for documents in the captured house of a Royalist, during the Civil War of Charles I.'s reign.

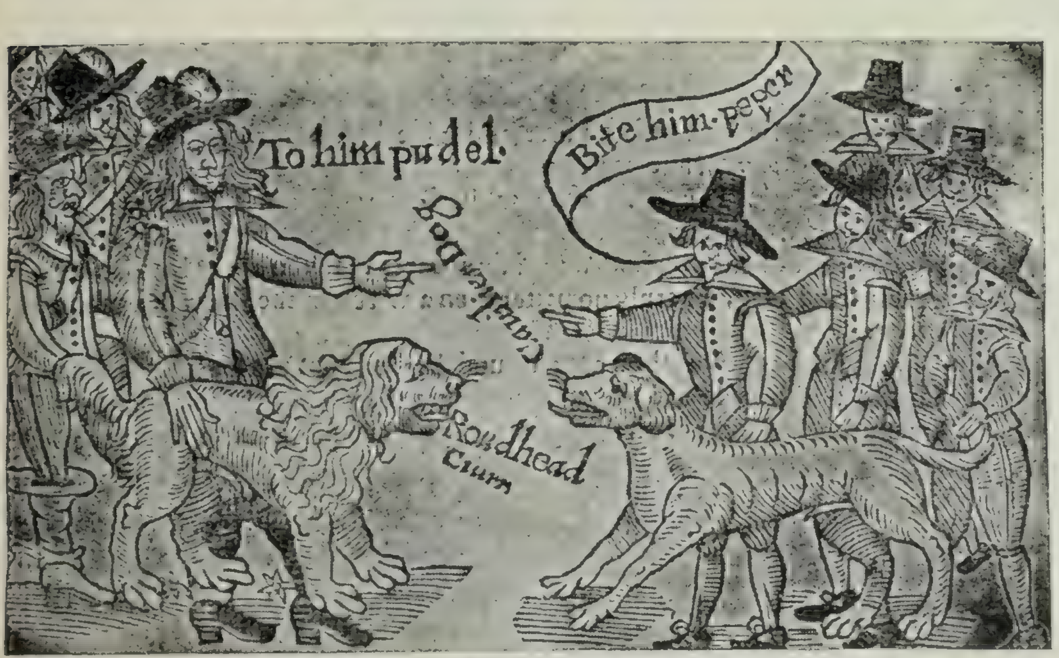
OLIVER CROMWELL SHOWS TALENT AS A FIERY FIGHTER.

In 1640 Charles I. was obliged to call another Parliament. His subjects in Scotland had rebelled against him and he wanted an army to punish them. But his treasury was empty, so he called a Parliament to vote him money. In this Parliament Oliver Cromwell sat as member for Cambridge (for he was now living in Ely) and with him were many of his Puritan friends. For two years they and the king struggled with one another, for Parliament was determined to make laws to stop the king ruling and taking money from the people without Parliament's consent. As time went on many people began to sympathise with the king, for they felt that Parliament was going too far and taking away the king's rights as well as stopping him doing what he had no right to do. At last the king thought he was strong enough to fight about the matter and in August, 1642, he set up his standard at Nottingham.

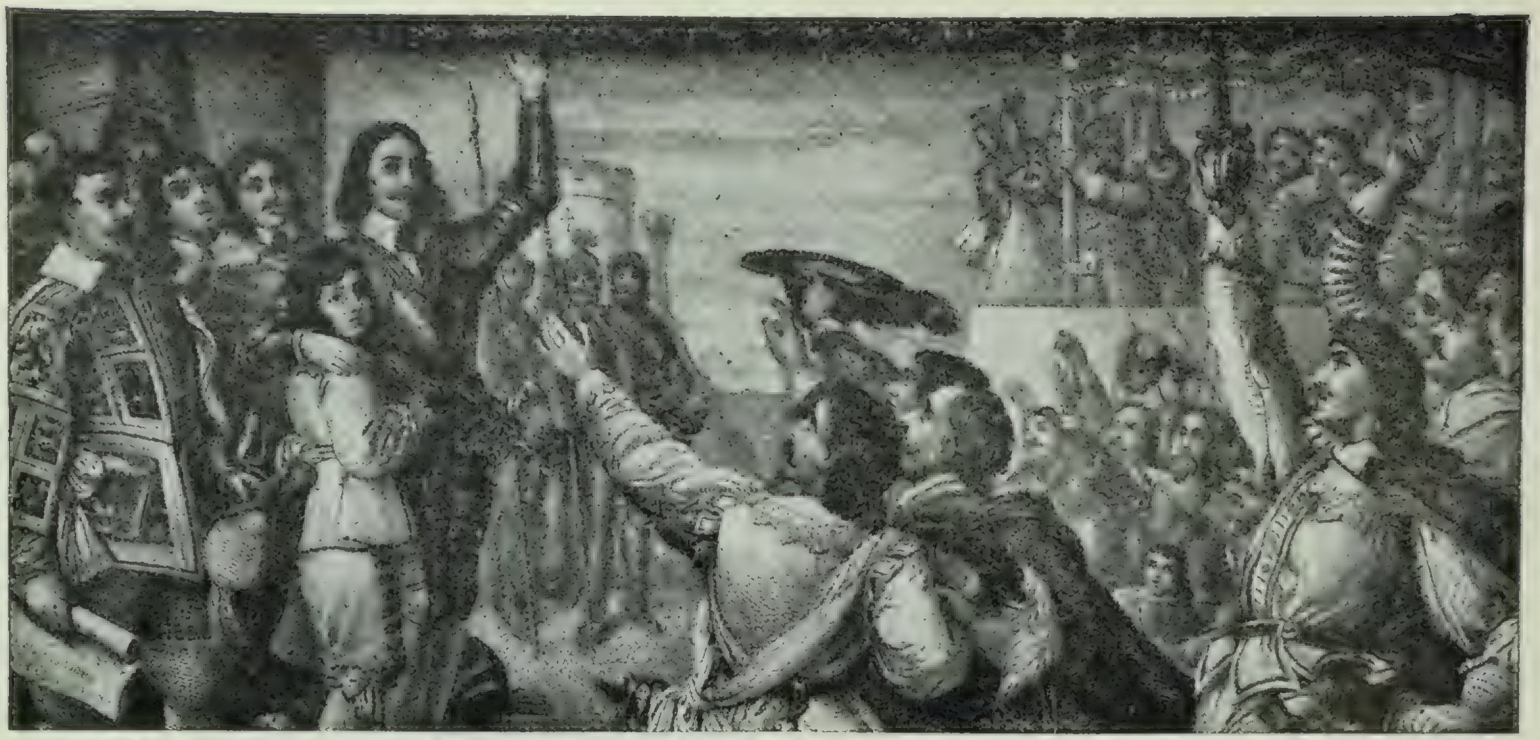
It was in the Civil War that began in this way that Oliver's talents as a soldier were shown. The first battle was at Edgehill in Warwickshire, where he was the captain of a small troop of horsemen which he had raised and armed himself in his own county. It was not a well fought battle, but Oliver was one of the four leaders of whom it was said that they "never stirred from their troops and they and their troops fought bravely till the last minute of the fight."

HOW OLIVER CROMWELL EARNED THE NAME OF "OLD IRONSIDES."

Then followed other battles in which the Parliamentary troops had the worst of it. This was because the Cavaliers, as the king's men were called, were for the most part gentlemen trained in the use of arms while the Parliamentary troops were, as Oliver told John Hampden, "most of them old decayed serving men and tapsters and such kind of fellows." He saw that if they were to beat the king, they must have trained men like his, and men who lived sober and God-fearing lives. So while fighting battles Oliver set to work to gather such an army. "I raised such men," he said, "who had the fear of God before them," men whom he found chiefly among the yeoman farmers, country squires and merchants of the eastern counties. These men he trained until they were the finest soldiers in England, and, as he proudly told Parliament when he was Lord Protector, "they were



A comic picture of the Roundheads and Cavaliers, setting their dogs at each other in the midst of a brawl; a cartoon drawn in the 17th century. [*British Museum*



"For God and King Charles!" The cavaliers swear loyalty, while the king's son nestles to his father's side.

never beaten, but whenever they were engaged against the enemy, they beat continually."

The first battle in which Cromwell led his new soldiers into battle was at Marston Moor in Yorkshire. Prince Rupert, the leader whom he defeated, gave them the nickname of "Old Ironsides," and this was the name by which they were henceforth known. The next year in another great battle, at Naseby, they defeated the king himself so badly that Cromwell hoped the war was ended and he could go back to his quiet country home that he loved. But Charles, though defeated, would not give up the struggle, which dragged on for nearly four years longer. Cromwell was now too important a man to be spared; he was the chief general of the army as well as one of the leaders in Parliament. In 1648 it was decided that Charles, who had been taken prisoner, must be put to death, and Cromwell, though he disliked the idea very much, agreed because he saw no other way of bringing peace to the country.

YOUNG PRINCE CHARLES TOUCHES THE LOYAL HEARTS OF HIS ADMIRERS.

But even after Charles was dead, there were still battles to be fought. Though the Ironsides clapped their hands and the Puritans were glad that a "tyrant" was dead, many people regarded Charles as a martyr and prepared to fight for his son to become king in his stead.

Particularly in Scotland and Ireland the people rose in arms for Prince Charles. Cromwell went first to Ireland. There he attacked Drogheda, which was being held for the prince, and led his men through a breach in the walls with "Our Lord God" for his watchword. Cromwell was not usually cruel, but he treated the people of Ireland very cruelly, because he had to hurry back to Scotland and he thought the Irish war could be ended quickly by terrifying the people.

STERN CROMWELL WINS THE DAY AND EARNS THE TITLE OF "PROTECTOR."

In Scotland, he was faced with an army twice the size of his own. But, in spite of this, his Ironsides won the day at Dunbar, on September 3rd, a day which Oliver always called afterwards his lucky day. This ended the war in Scotland, but he had still to fight with Charles, who had slipped over the border into England. Cromwell came up with him at Worcester, and there he fought his last great battle, using as his watchword "The Lord of Hosts." Charles was defeated and fled to France, and Cromwell then had to turn to the work of ruling England.

For seven years he worked at this task. He had many difficulties, for many people did not like his sternness and his Puritan ways, and wanted the king back again. But for those seven years he kept England at peace, and made her respected abroad, so that foreign kings talked of "Oliver, Protector" as "the greatest and happiest prince in Europe." In 1658 on his lucky day he died in the palace of Whitehall. He was troubled for the future of the country which he loved and for which he had fought and worked, but his trust in God was firm, and his last words were "My work is done. Yet God will be with his people."

THE ROMANTIC HISTORY OF A SEA KING

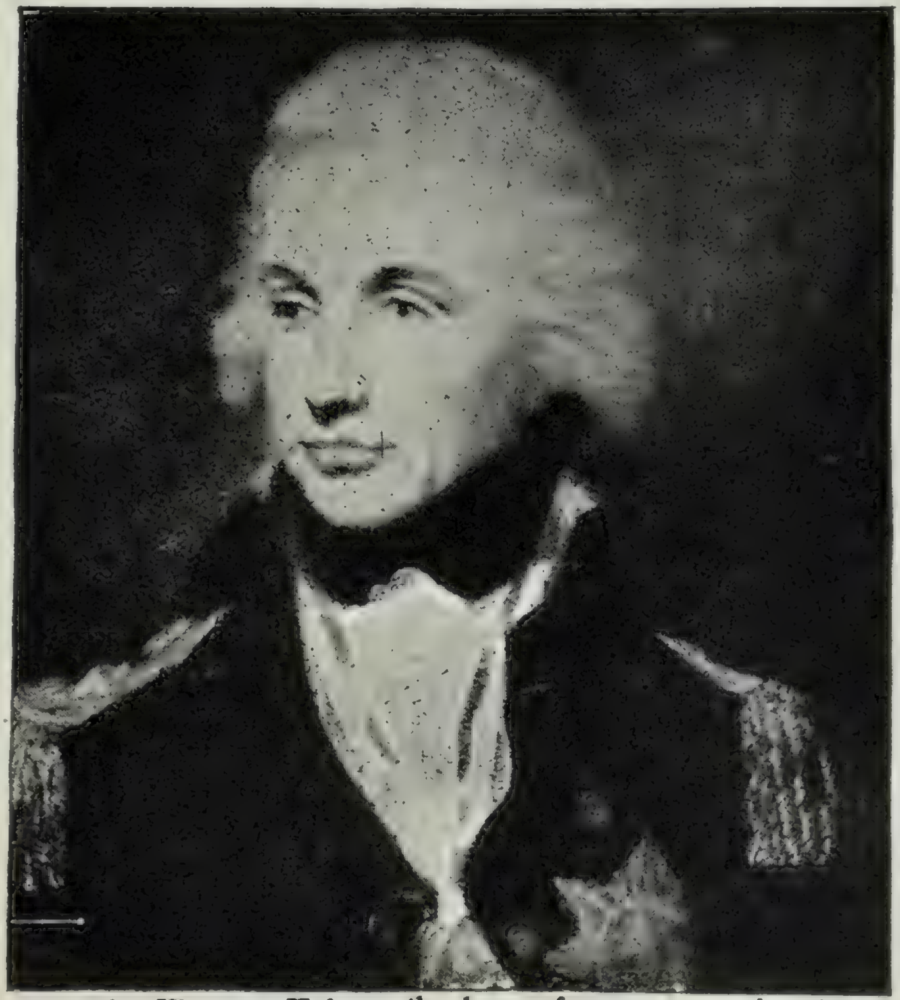
ONE bleak spring morning in 1771, a small boy, pale, thin and delicate looking, was wandering about the dockyard at Chatham. He looked rather miserable, as indeed he felt, for he had just left his vicarage home at Burnham Thorpe in Norfolk and he longed to be back riding to school with his brother, bird-nesting, fishing and exploring the countryside.

THE BOY, WHOSE DREAM OF BEING A GREAT SAILOR, CAME TRUE.

Suddenly he heard a bluff, hearty voice saying " Well, my boy, and what may your name be ? " and looking up he saw a tall naval officer smiling down at him.

" Horatio Nelson," he answered, " and I am looking for my uncle's ship, the *Raisonable.*" " Come with me," said the officer, " I know your uncle well, and I will see you on board."

This was the beginning of young Nelson's career as a sailor. His first cruise was to the West Indies, a voyage which in those days took many months. Then, although he was only fourteen, he went on a Polar expedition, where he had a stirring adventure with a polar bear whose skin he wanted to take home to his father. On his return to England he was sent to the West Indies again, to take part in the war with France and Spain, who were supporting Britain's rebellious American colonists. Though he was only twenty he gained great distinction against the enemy. On the day when he was appointed captain he said, " I am now only a captain, but I will, if I live, be at the top of the tree."



Horatio, Viscount Nelson, the hero of many a rousing fight.
[*From the portrait in the National Portrait Gallery*

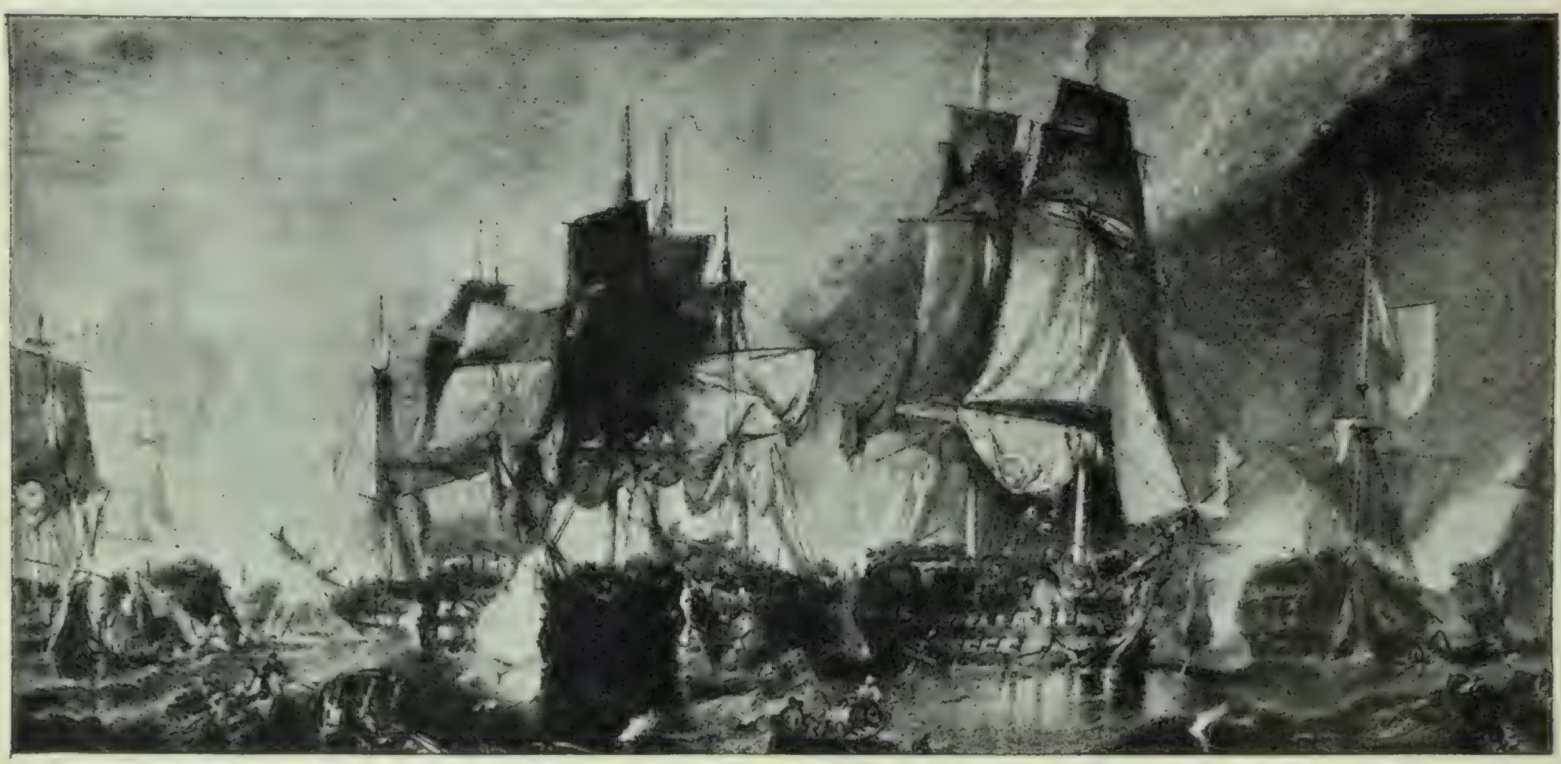
When war broke out again between England and France in 1793, Nelson gained his great wish and was given command of a battleship, the *Agamemnon.* In those days commanders had to man their own ships, and many found difficulty in getting men to serve, and had to take those whom the press gang had kidnapped. But Nelson was already known to be such a brave seaman and so considerate for his sailors that men flocked to his flag.

Lord Hood, the chief English admiral, gave Nelson a difficult task. This was to help the people of Corsica, who were trying to free their island from the French. The French greatly outnumbered the English, but, said Nelson, " I always was of opinion that one Englishman was equal to three Frenchmen," and 1200 British seamen succeeded in forcing 4500 French to surrender to them.

In 1798 Nelson won the first of his most famous battles. Napoleon Bonaparte, who was the inveterate enemy of England because she stood in his way of making France the most powerful country in Europe, sailed for Egypt on his way to India.

HONOURS ARE HEAPED ON NELSON FOR HIS DEEDS OF BRAVERY.

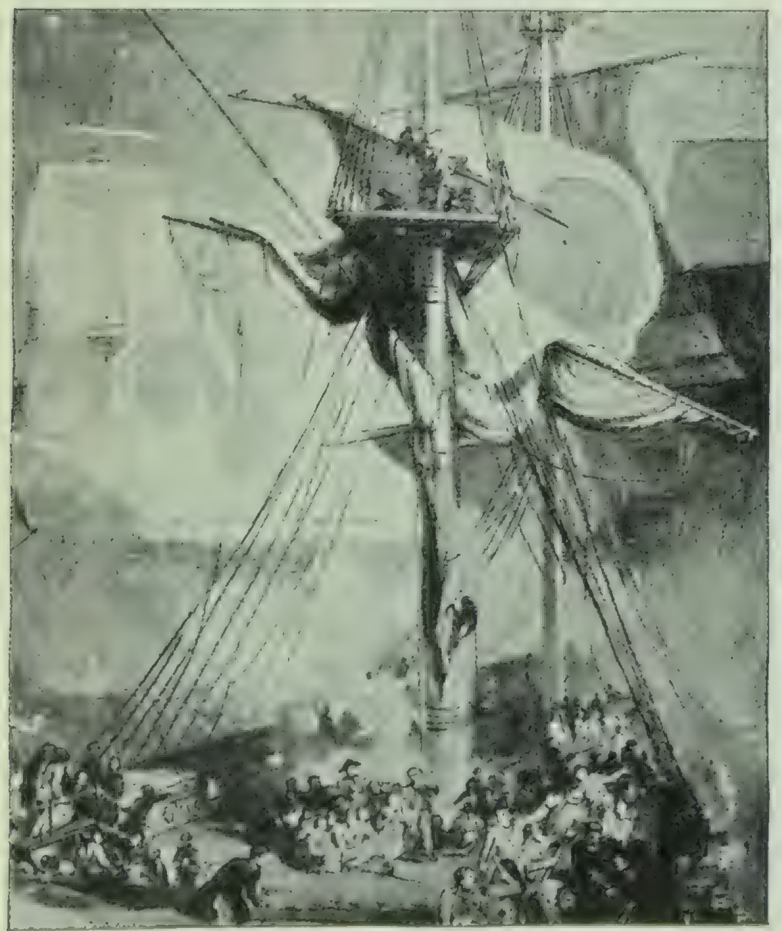
Nelson, who had been given the chief command of the English fleet, at once followed him to the Mediterranean, and on August 1st sighted the French fleet lying at the mouth of the River Nile. With his captains, Foley, Berry, Hood and his great friend, Hardy, Nelson drew up his plan of attack. Hood, in the *Zealous*, was to lead the line, while Nelson in the *Vanguard* was to sail sixth in case he should want to alter the plan at the last moment for the ships behind him. Skilfully the line of British vessels threaded its way among the shoals and sandbanks of the river mouth until it lay between the French fleet and the shore. Then the signal was given and broadside after broadside was poured into the enemy. When dusk fell, hardly a French ship was left. Napoleon, cut off from France and any hope of



"England expects every man to do his duty." The Battle of Trafalgar, where Nelson won a famous victory, and gave up his life, refusing to cease action to the last. [*After the picture by Stanford in the Royal United Service Club.*

reinforcements, had to give up his plan of invading India and return to France.

When Nelson returned home, all England turned out to do him honour. Bonfires were lit at Yarmouth, where he landed among crowds of cheering citizens; in London the City entertained him to a banquet and honours of every kind were showered upon him. He was not, however, to stay at home long, for Napoleon had gathered another fleet, this time in the Baltic, and the English navy had once again to sail out to do battle with it.



Turner, the great painter, depicts for us the famous battle where Nelson died bravely in action, encouraging his men to continue the fight to the end.

This time Nelson was second in command under Sir Hyde Parker. The two fleets came into action at Copenhagen, and when the fight was going against the English, Sir Hyde Parker gave the signal "Cease action." When Nelson was informed of the signal, he exclaimed, "Leave off action! I'm hanged if I will." And putting his glass to his blind eye (for he had lost his left eye in a fight many years before), he said calmly, "I do not see the signal. Keep mine for closer action flying." Nelson's daring disobedience saved the day and won another victory for England.

THE "VICTORY" SETS SAIL FROM PORTSMOUTH ON NELSON'S LAST JOURNEY.

In 1805 came Nelson's greatest and last battle. The French fleet came out of Cadiz harbour and Nelson, who for three years had been guarding the English Channel and defending England from "Boney," as the English people dubbed their greatest enemy, was overjoyed at the chance of coming to grips with it. "Depend upon it," he exclaimed, "I shall yet give Monsieur Villeneuve (the French admiral) a drubbing."

On September 13th the *Victory*, Nelson's flagship, set sail from Portsmouth. Great crowds gathered to bid their hero "God speed," and to see the great ship pass out of the harbour with all sails set, the ensign flying at the stern, and the white admiral's flag fluttering at the fore-topmast. A fortnight later she joined the rest of the fleet, lying off the coast of Spain, near Cape Trafalgar. It was Nelson's forty-seventh birthday. One morning the signal was flashed, "The enemy are coming out of port." Nelson summoned his captains on board his flag-ship and gave them his orders. "First lay your ships close aboard the enemy, and then continue them there." It was a daring plan, such as only a genius like Nelson would order, and only men who loved and trusted him completely would support.

"England expects that every man will do his duty." This was the signal that fluttered from the masthead of the *Victory* on the morning of October 21st. Nelson, leading his ships, was soon "close aboard" the enemy, and Collingwood, his second in command, led the second English line. Nelson, his breast covered with medals, stood on deck in full sight of the enemy. To a friend who begged him to take them off because they presented a mark for the enemy sharp-shooters, he replied, "In honour I gained them, and in honour I shall die with them."

A French sharp-shooter marked him, took careful aim and fired. Nelson was carried below dying. To the doctor who came to him he said, "You can do nothing for me; give your care to others." Suddenly shouts and cheers arose, and Hardy, who was in command of the ship, came down to tell him that victory was won. "Thank God I have done my duty," murmured Nelson. They were his last words.

Nelson's victory at Trafalgar shattered the navies of France and Spain and left England mistress of the seas. Not until two weeks later did the news reach England, where the joy of victory was shadowed with mourning for the death of England's hero. He was laid in honour in St. Paul's Cathedral, and to this day English seamen wear their black scarves in memory of him.

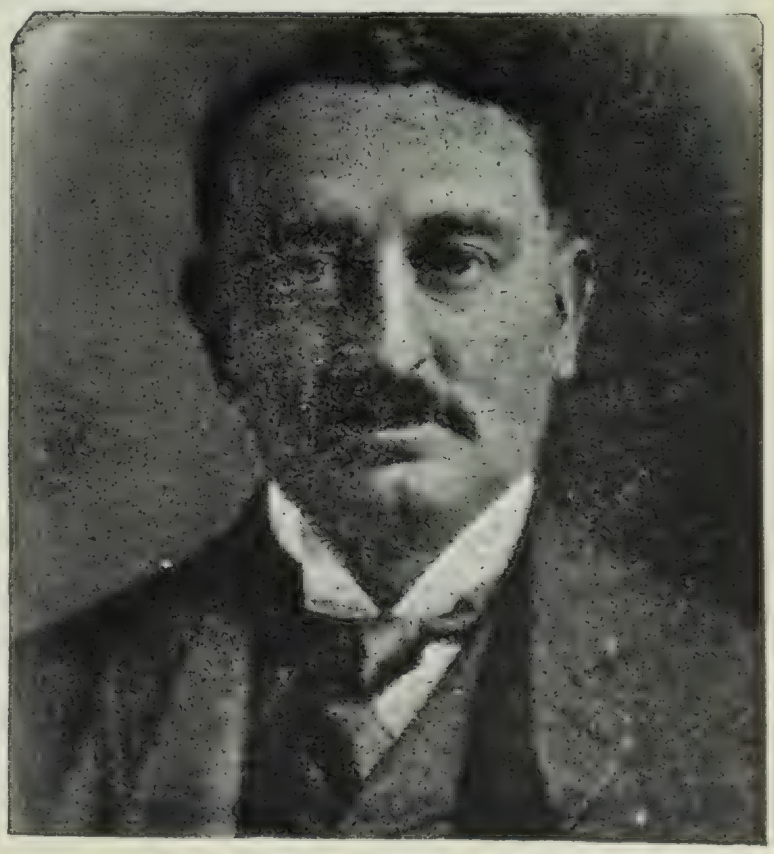
RHODES GAINS NEW LANDS FOR BRITAIN

SOME people think that statesmen always belong to rich families, and do nothing all their lives but help to govern the country. This is the story of a man who started life as a comparatively poor boy, who became a rich man through business and, before he died, added large territories to the British Empire.

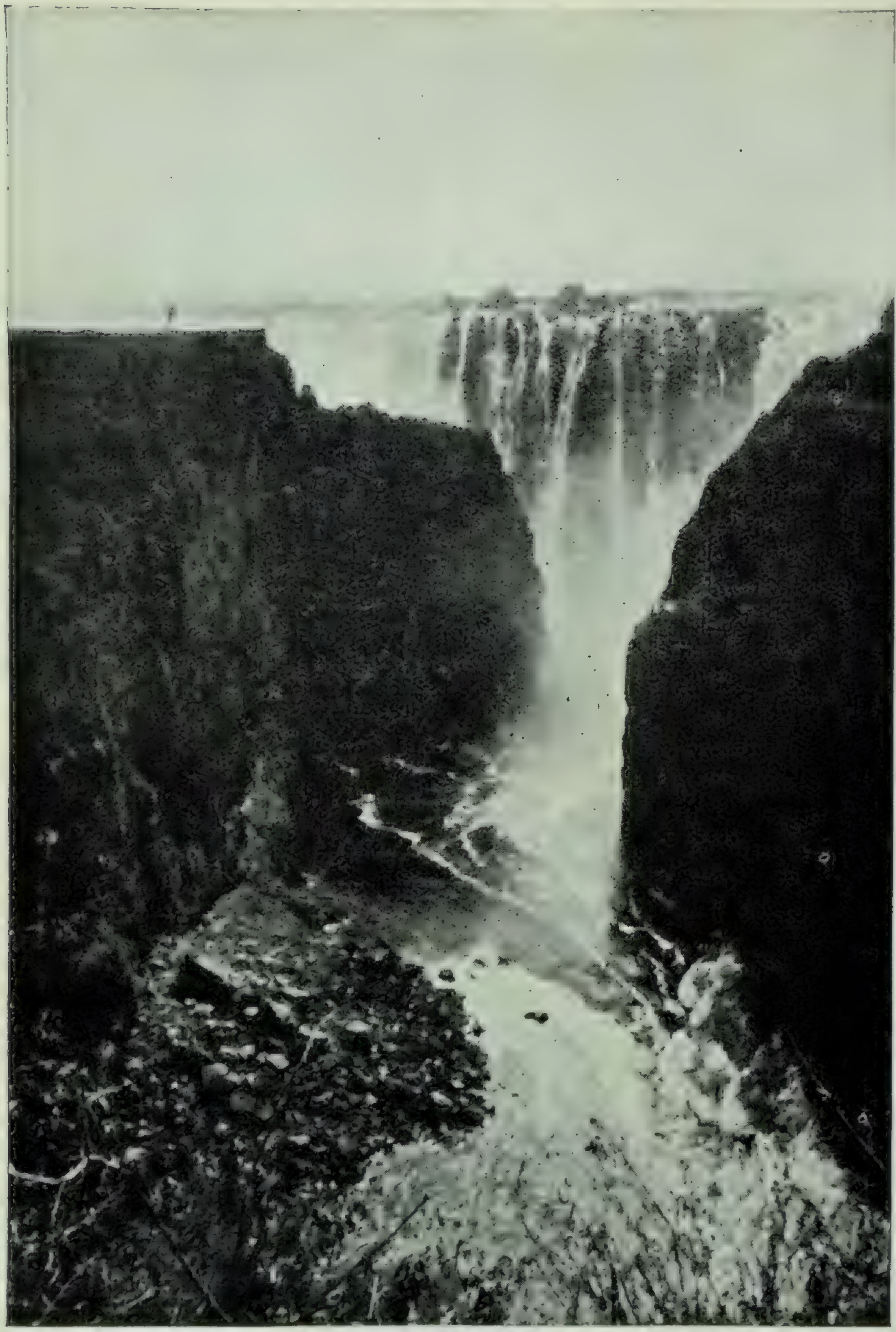
It was in the quiet little town of Bishop's Stortford that Cecil Rhodes was born. With his brothers and sisters he spent many merry hours playing in the garden of their old house or wandering through the shady Hertfordshire lanes chasing butterflies and hunting for birds' eggs. At the Grammar School of Bishop's Stortford he was very quick at learning, and his great desire was to go to a university and become a great scholar. But he was not a strong boy and was often ill, so that when he left school his parents decided to send him out to Natal in South Africa, where his elder brother was already settled. Rhodes was very disappointed at this, but he made up his mind to help his brother as well as he could and earn money so that later he could come home and carry out his dream of going to Oxford.

RHODES SETS OUT TO FAR COUNTRIES IN SEARCH OF FORTUNE.

For a year the two brothers worked on a little cotton plantation. Then there came the opportunity to earn money quickly. A diamond field was discovered near Kimberley, so the brothers sold their estate, packed all their belongings in waggons, and trekked hundreds of miles to try their fortune as miners. They made enough money for Cecil to come home and go to Oxford. But soon he fell ill again and had to go back to Kimberley, where he got better. But he was not to be beaten and for the next five years he spent part of the time in South Africa and part at Oxford, until in 1881 he was able to take his degree.



Cecil Rhodes, Empire builder.



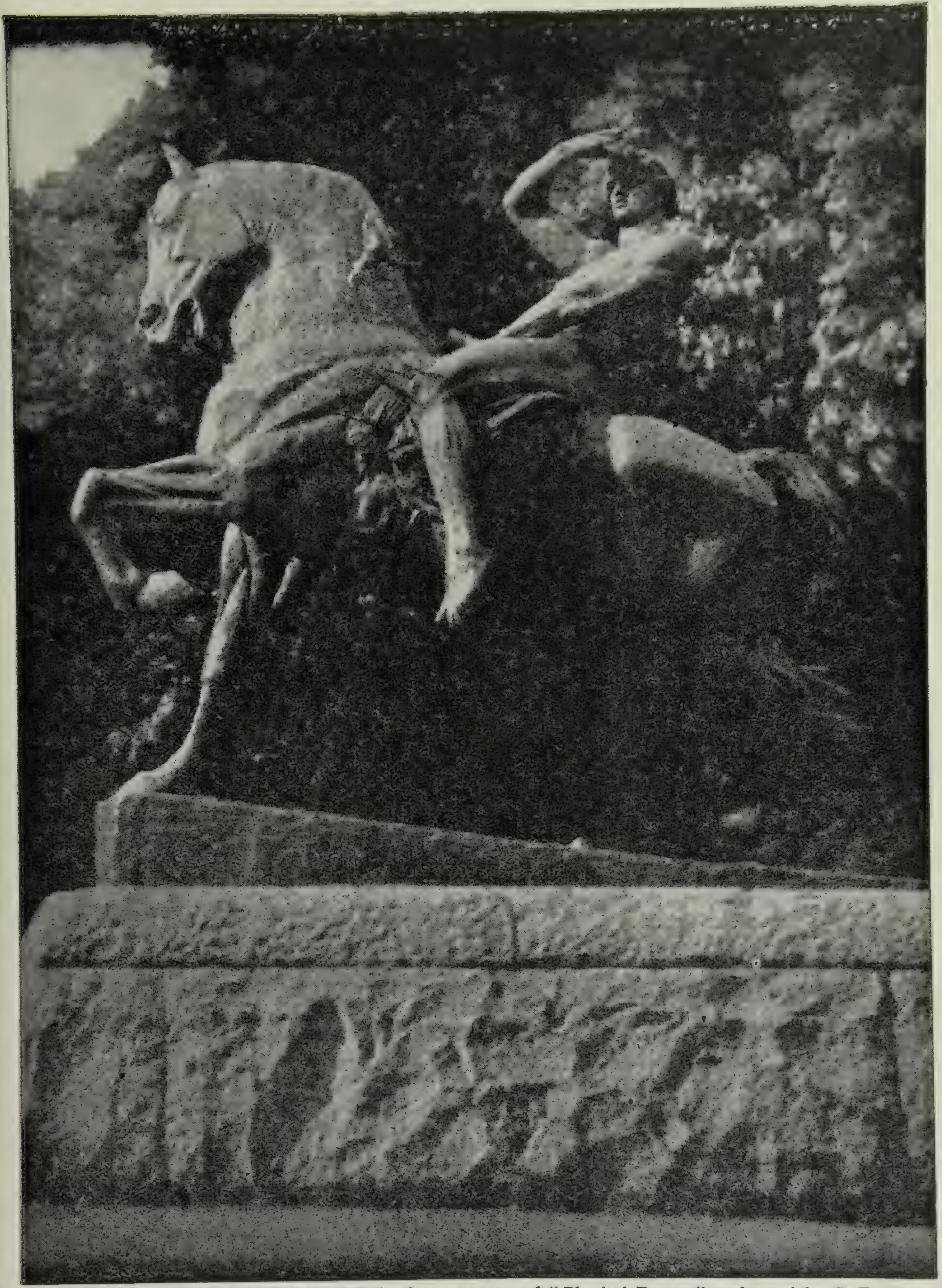
With thundering sound, and with spray rising high into the air, the Zambesi hurls itself over the Victoria Falls before sweeping on its way to the ocean.

great dream was to found a line of British territories all the way from Cape Colony in the south of Africa to Egypt in the north, with a railway line running through it from the Cape to Cairo. Now he was rich he set about realising his dream.

He began by getting into the Parliament of Cape Colony. Then he turned his attention to the land lying north of Cape Colony, which was inhabited by a native people called the Bechuanas, over whom the Boers (or Dutch) who lived in the Transvaal, a neighbouring state, had already gained control. They did not treat the natives well, and so the British interfered to protect them. Rhodes went there with a small force of British soldiers, and the Boer leader told Rhodes when they met that they would have to fight about the matter. " Very well," said Rhodes, " but let us have breakfast first." By the time they had finished, they had settled matters peacefully. The Boers agreed to return to their own state, and Rhodes had gained Bechuanaland for Great Britain. Then he sought to get still farther north. Between Bechuanaland and the Zambesi, which David Livingstone the great missionary had explored thirty years earlier, lay a great tract of fertile land inhabited by the Matabele and the Mashonas. It was this land that Rhodes wanted to gain for Britain. But the Boers also wanted it, and so did the Germans, who were colonising south-west Africa. Rhodes saw that he must act quickly, so he made an agreement with Lobengula, King of the Matabele, to allow the English to work the gold that existed in his land and not to admit any other white men into his territories. Then he persuaded the English Government to

All the time he was doing this, he was continuing his work in the diamond fields at Kimberley. He was a very good business man and he made so much money that before he was thirty he was nearly a millionaire. But he did not want to be rich simply to have an easy time; he wanted to use his money to help his country. At school and the University he had always been interested in history and particularly in the history of the British Empire. He believed that it would be good for England and for the world generally if British rule in Africa were extended, and his

"PHYSICAL ENERGY"—A TRIBUTE TO RHODES



In Kensington Gardens stands this copy of the famous statue of "Physical Energy," sculptured by G. F. Watts, O.M., R.A., to stand in South Africa as a memorial to the energetic life and work of Cecil Rhodes.

allow him to form a company called the British South Africa Company to work the gold mines and to look after the country generally. Rhodes himself was the head of this company. He was so successful that soon he and the men who worked with him were the real rulers of the country, which was named Rhodesia after him. White men came to settle in the land and Rhodes was able to build his railway still farther north. King Lobengula did not like all this very much, but he had to submit for he was not strong enough to fight against it.

RHODES, THE MAN OF MANY SCHEMES, IS TURNED OUT OF CAPE COLONY.

Next the Company pushed across the Zambesi and opened up more territory which they called Northern Rhodesia. A bridge was built across the Zambesi near the wonderful Victoria Falls, and the railway was carried across it still farther north. Rhodes was getting along famously with his schemes when suddenly a check occurred. The Boers of the Transvaal did not at all like the British advance northwards, for their little state was now almost surrounded, and they became angry and afraid. They began to treat the British people who lived in their country and worked the gold mines of the Witwatersrand very badly. Now Rhodes was a great mine owner as well as the leading British statesman in South Africa, so he could not stand by and see the British miners unjustly treated without doing anything. So he had to stop his schemes for pushing on northwards and take up the cause of the British in the Transvaal.

Now Rhodes made his great mistake. He had been made Prime Minister of Cape Colony in 1890, and he decided too hurriedly that the only way to settle the matter was by fighting. But the English Government was unwilling to support him, and without English support, the colonists at the Cape could not hope to fight the Boers successfully. While he was considering what to do, one of his followers, Dr. Jameson, carried out a raid into Boer territory. He had very few men with him and was easily overpowered. Rhodes tried to stop him, but was too late. People blamed him for the raid so that he had to retire from his position as Prime Minister and to leave Cape Colony.

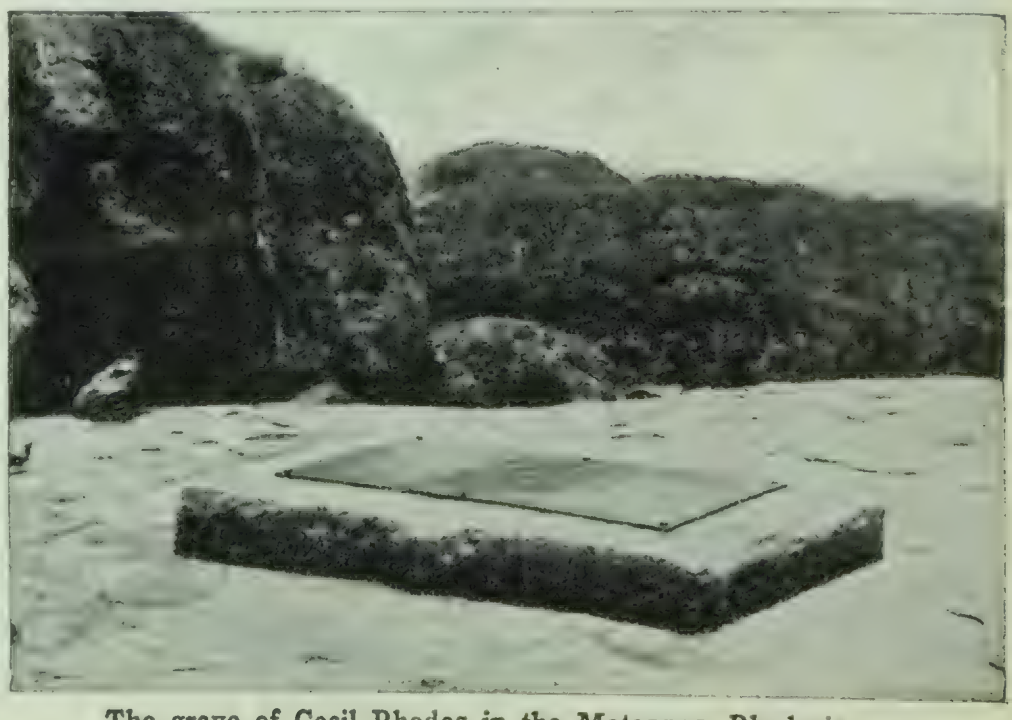
RHODES DIES AFTER THE RIGOURS OF A FIVE MONTHS' SIEGE.

He went to Rhodesia, which was the place he really loved, and there he was able to do more good work for Britain. In 1896 there was a rising of the Matabele, and Rhodes risked his life by going unarmed into the Matabele camp to talk with the rebel chieftains. Rhodes faced them so bravely that in the end he was able to settle the matter peacefully.

In 1899 the trouble in the Transvaal led to war and Rhodes went at once to Kimberley and helped to defend the city when it was besieged by the Boers. When the town was relieved he went back to his house near Cape Town, for his health had become very bad during the five months' siege. He died there just before the war ended. His last request was that he should be buried in the Matoppo Hills where he had faced the angry Matabele six years before.

Rhodes did not live to see his dream of an "All Red" route from the Cape to Cairo become a reality. But if he were alive to-day he would see how his work had been followed up. For now a great chain of territory from the Cape to the Egyptian borders is either part of the British Empire or is under the protection of Great Britain. The railway that he started has not been completely built, but his plans have been realised in a way he never thought of, for there is now an Air Service from Cairo to the Cape.

To-day we often forget how much of our African dominion we owe to Cecil Rhodes.



The grave of Cecil Rhodes in the Matoppos, Rhodesia.

Here, under the shadow of the Great Pyramid, modern Egyptians till the land that borders the desert.

SEVEN WONDERS OF OLDEN DAYS

The phrase, " The Seven Wonders of the World," has been on the lips of men for ages. Nowadays we think of such erections as the Empire State Building in New York, the Sydney Harbour Bridge in Australia, wireless telephony, and such modern examples of man's skill. These to us are the wonders of the world. In ancient days people looked on seven man-made structures as the world's greatest feats of human skill, patience and inspiration. The seven proudest achievements of the world of old are described here. It is a sad thought to remember that only one of these still stands to-day. Time does not spare even the greatest works of mankind. Wind and rain slowly but surely destroy buildings made of stone. Of the seven ancient wonders, only the Great Pyramid remains.

IN the British Museum, in London, there is a special room known as " The Mausoleum Room." In it are marvellous remains: relics from Halicarnassus, that ancient Grecian town of wondrous fame, and fragments of the splendid tomb and monument once standing there, the ruins of which were discovered in the middle of last century,

Over one thousand years ago a sorrowing queen, deprived of her king by death, caused it to be raised so that she might for ever recall to the nation the memory of a renowned king.

About three hundred years before Christ was born there reigned in Caria, a country in Asia Minor, a king named Mausolos and his queen, Artemisia. When the king died, his wife, who ruled after his death, became so sad that she was unable to do anything but weep over the loss of her dear husband, in whose daily companionship she had been exceedingly happy. After a time she decided to devote her days to the erection of a monument to Mausolos, for he, who had been a very good and wise ruler of his country, deserved well to be kept before the eyes of men.

For this purpose she called to her court the best architects and sculptors from all parts of Greece, then the centre of the art of the world, and commanded them to design the most beautiful monument within their power, sparing no effort and troubling not at all how much money would be required in order to carry out their plans, as she was determined to build a fitting monument to her husband.

Famous men who worked for her were Pythius and Satyrus; and the four best known artists of the day undertook to do one side each of the memorial. They commenced their task, Bryaxis working on the North side, Timotheus doing the South, Leochares adorning the West, and the great Scopas decorating the East side. For the site of the monument the queen chose the middle of a wide street in the centre of the city of Halicarnassus, an old

ARTEMISIA
MAUSOLOS

Mausolos and his queen, Artemisia, reigned in Caria, a country in Asia Minor, many hundreds of years ago.

Greek town which Mausolos had made the capital of his country. She knew that in such a conspicuous position all citizens and visitors could not fail to notice the superb erection. Queen Artemisia died before the work was completed, but the artists worked on until they had entirely carried out their magnificent ideas ; and they brought their labours to so successful an end that they realised the queen's desire that the monument should become one of the wonders of the world.

THE MAGNIFICENT MONUMENT BUILT BY A BROKEN-HEARTED QUEEN.

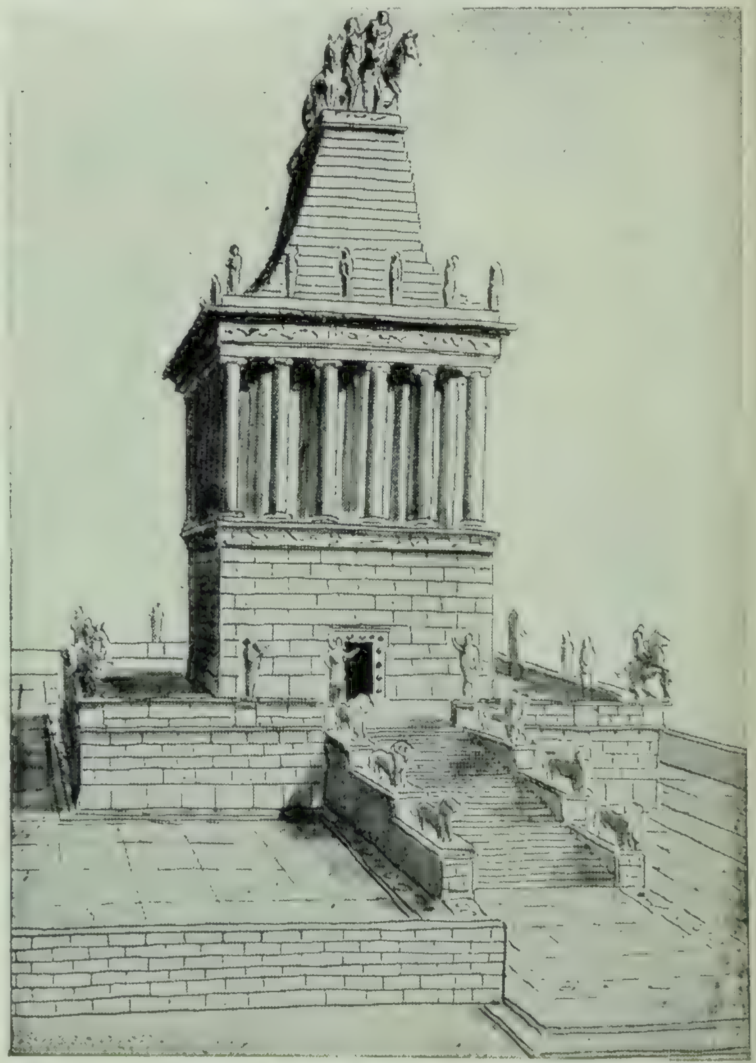
Although there remain now but broken pieces of this fine structure, we know of the original design from the writings of Vitruvius, a Roman architect and engineer, and from those of Pliny, an historian of the first century A.D. The style of architecture chosen was the Ionic, one of the three principal Greek forms, distinguished by its columns with bases, its capitals with spiral scrolls, and the entablature (that is the part above the column, which was divided into the architrave, the frieze and the cornice), and the material used was the finest white Parian marble.

The monument rose to a height of one hundred and forty feet from the ground and its greatest circumference was four hundred and sixty feet, while it was divided into five principal parts.

THE BEAUTIFUL DECORATIONS WHICH ADORNED THE MONUMENT OF MAUSOLOS.

At its bottom was a basement made of blocks of greenstone covered over with marble, with groups of statues all around, and in the very middle of this chamber the body of the King was laid, after which a huge stone was put over the entrance to keep away thieves. Over this was built an enclosure which had thirty-six columns, between each of which a statue was placed. A splendid frieze, which was coloured in red and blue, and described combats between the Greeks and the Amazons, those women warriors who fought so fearlessly, crowned these columns. A pyramid, consisting of twenty-four steps, came above the colonnade and this led up to the pedestal. Ancient writers have remarked on the clever arrangement of these steps, for they gave the effect of being suspended in mid-air.

On the pedestal Pythius set his renowned chariot group which, according to the normal design of Greek art, is the great central theme,

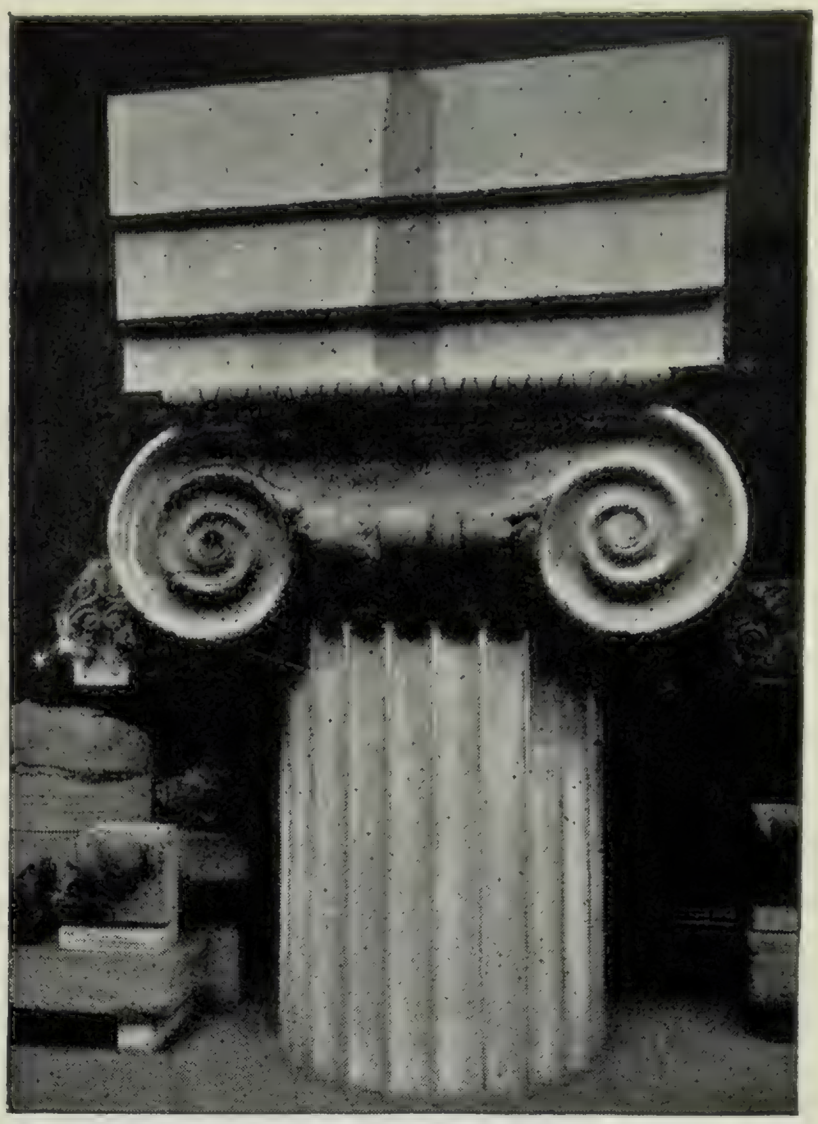


After her husband's death, the sorrowful queen caused this wonderful monument to be erected at Halicarnassus in honour of Mausolos. She died before it was completed.

and supplies the key with which one may understand the meaning of all the other statues and decorations throughout the work. This group consisted of gigantic figures of four horses (sometimes thought to have been copied from Alexander's horse, Bucephalus) drawing a chariot in which were two figures, about ten feet high, one being a man and the other a woman. The statue of the man, now in the British Museum, is doubtless Mausolos himself. It is certain, too, that it was taken from an actual portrait of him, and certainly he is a kingly figure. The draped figure of the woman is probably the devoted Artemisia driving to heaven with her husband; some people, however, believe that it is the special Goddess of Mausolos, who had looked after him in life and who had come to drive him up to heaven in her chariot. A photograph of the two statues, as seen to-day, is shown on the opposite page.

SCULPTURED ANIMALS FOUND AMONG THE TREASURES IN MAUSOLOS'S TOMB.

Among the remains discovered were at least twelve statues of men and many more of various animals, such as rams, boars and hounds. Twenty lions have been unearthed and these were all made in standing positions as sentinels (for in those days sculptured lions were frequently placed on tombs to guard them) and they were all painted, very likely in a brownish-red colour. Portions of at least three separate friezes are now in the British Museum, showing chariot races and also a fight between the Greeks and Centaurs (who were half horses and half men) at a marriage feast.



Part of the *capital* or top of a pillar which remains to show the beauty of the famous Mausoleum.

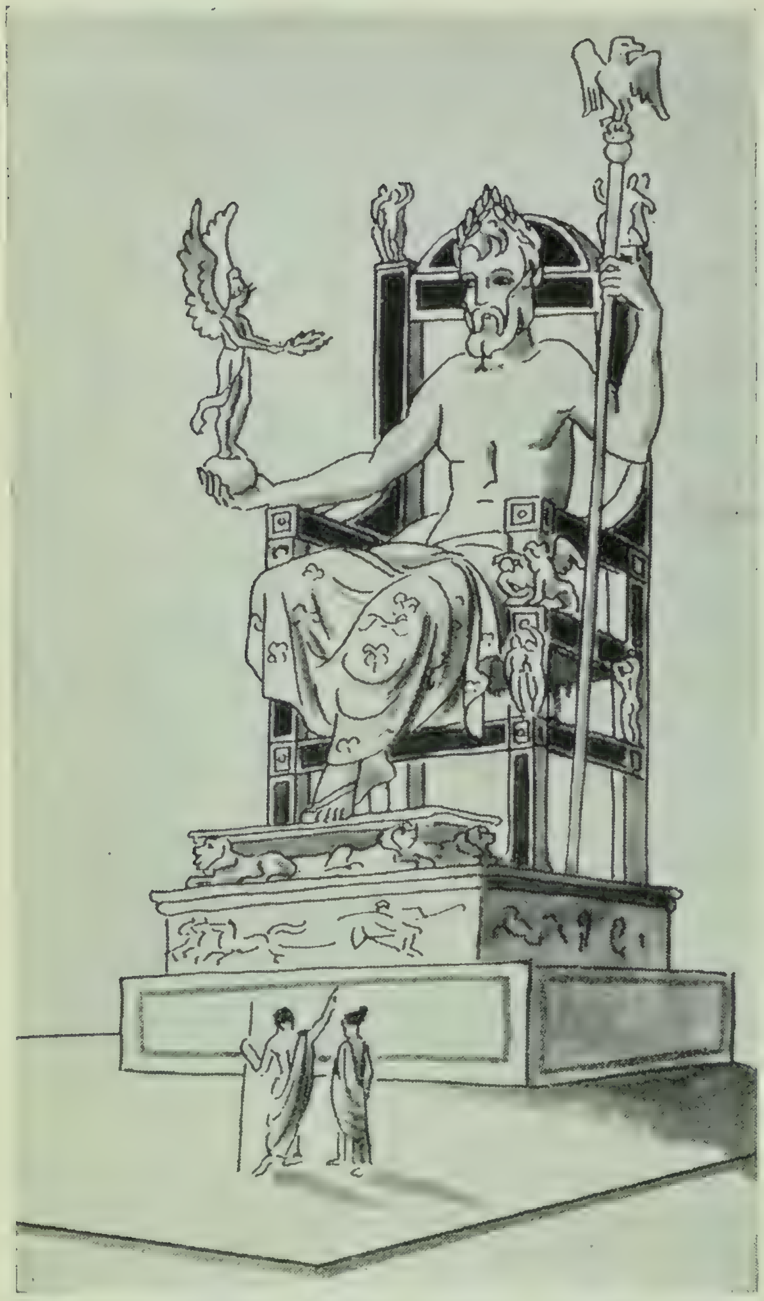
Even should we lose the still existing treasures of Mausolos's tomb from the British Museum, the memory of this ancient wonder of the world would not perish, for we have taken into our own language from the Greek the name "Mausoleum." We use this word to-day to describe a tomb of very great size and beauty erected as a memorial to some prominent person.

THE GREAT STATUE OF ZEUS AT OLYMPIA

TO the West of Pisa in Elis lies a beautiful plain which was of universal renown in the days when Greece was one of the great countries of the world. For Olympia was truly the national centre of the Greek religion, and here were the artists and lovers of beauty in thought, in sculpture and in literature. This love of beauty of every kind played a large part in Grecian life and thought.

Part of this plain was called the Sacred Grove or *Altis*, and in this level space, which was finely wooded and especially noted for its sycamore trees, were the sanctuaries, the space for the Olympic games, and the celebrated temple to Zeus, inside which was his mighty statue. This Sacred Grove is said to have been measured out and the boundaries enclosed within a wall by Heracles himself.

Here it was that every fifth year huge crowds assembled to witness the Olympic games and keep the feasts of Zeus. These games were thought to have been founded by Heracles, the son of Amphitryon, and as Heracles and his brothers were five in number the custom arose of holding them every five years. Only those of pure Greek blood could take part in the games. No slaves could join in them, neither were any women allowed to be present though they could send chariots and men to compete in the races and contests. For four to seven days the games continued; there were races of different kinds: foot races,



The statue of Zeus—a superb work of art—was erected by a clever sculptor in honour of the great Olympian god.

races with chariots and horses, and with mules and chariots ; wrestling, boxing, gymnastics of varying types ; all these formed a part of the sports held in honour of Zeus. The victors were crowned with olive leaves from a sacred olive tree said to have been planted by Heracles with his own hands.

THE GREEK GOD, WHOSE STATUE WAS ONE OF THE WONDERS OF THE ANCIENT WORLD.

The splendid temple which was erected here to the honour of Zeus was designed by Libon of Elis, who lived in the sixth century B.C., and more than one hundred years had passed by before it was completed. The foundations, which can now be seen, were laid slightly above the level of the ground so as to render the building more prominent, and Libon selected the Doric style of architecture. This was the commonest of the three chief types then in use and was the usual one for the great temples. It differed from Ionic and other types in having a base of two to three steps for the support of the statue or building, and a special kind of column without bases. The capitals or decorated tops of the columns or pillars differ from the Ionic ones, and the whole effect is stately and majestic.

The back and front had six columns and the two sides had thirteen. Each column, which was fluted, was over seven feet in diameter, and no other temple had such thick ones, the largest being a little over six feet.

THE TWELVE LABOURS OF HERCULES WERE DISPLAYED ON THIS FAMOUS STRUCTURE.

The East side was decorated with gigantic figures, twenty-one in all, showing the moment before the chariot race between Oenomaus, king of Pisa, and Pelops, son of Tantalus, to decide the fate of Hippodamia. On the west side were depicted the struggle of the Lapithae (a warlike race coming from Thessaly) and the Centaurs (those beings who were half-horse and half-man) on the occasion of a great marriage feast. One of the friezes, of which several pieces are now in the Louvre at Paris, displays the Twelve Labours of Hercules.

Marble slabs formed the roof, and the inner space inside the front porch leading to the main part of the temple was paved with variously coloured pebbles. These were taken from the bed of the Alpheus, the river which flows through the plains of Olympia, and were arranged with the use of white cement to form a design of Tritons, or demi-gods of the sea, and sea-monsters. The exterior of the temple was in stone with painted terra-cotta for decoration. Innumerable paintings and sculptures add to the beauty of the interior.

The famous statue of Zeus, the supreme glory of this magnificent temple, was in the west part of the temple, directly facing the entrance so as to attract the attention of all who entered, and it was approached through a double row of columns. From a gallery above one obtained perhaps the best view of the god. Pheidias, the greatest of all sculptors, who was born about the time of the Battle of Marathon, was called from Athens to Elis to execute this statue for the Greek people. He spent four to five years in working at it, for he wished to express in sculpture the ideas of the Greek poet, Homer, who in the Iliad describes the characteristics of the god.

In this superb work of art Zeus was shown as the greatest of all gods, and the national deity of the entire Greek race. One saw him as the all-wise, the all-powerful, the personification of justice and goodness, and full of fatherly care for the weak and suffering, the ruler of both gods and men. Those who looked upon him acknowledged him as the great conqueror, who, in perfect peace and tremendous majesty, governed the whole world.

The statue stood about forty feet from the ground and reached nearly to the roof of the temple. It belonged to the chryselephantine class of idols, having a foundation of stone or wood with plates of ivory on top to represent the flesh and plates of solid gold for the drapery and ornaments.

The throne on which Zeus sat was made of cedar wood and enriched with decorations in gold, ivory and ebony; precious stones such as rubies, emeralds, sapphires were inlaid in many parts; in all suitable places figures were painted and sculptured upon it. At the back and sides were small screens, with blue, red and yellow enamel work; figures in gold adorned the base of the throne and the stool for the god's feet. A wreath of olive leaves, to indicate his conquest of gods and men, rested on his head, and his sandals were of solid gold. His skirt was of gold and on it one saw enamel flowers in many rich and lovely tints. His right hand held a statue, in ivory and gold, of victory, and in his left was a richly carved sceptre, adorned with an eagle at the top. Groups of sculptured figures had been placed all round the throne. Usually, out of reverence, the statue was hidden by a curtain, being visible to the people only on certain days.

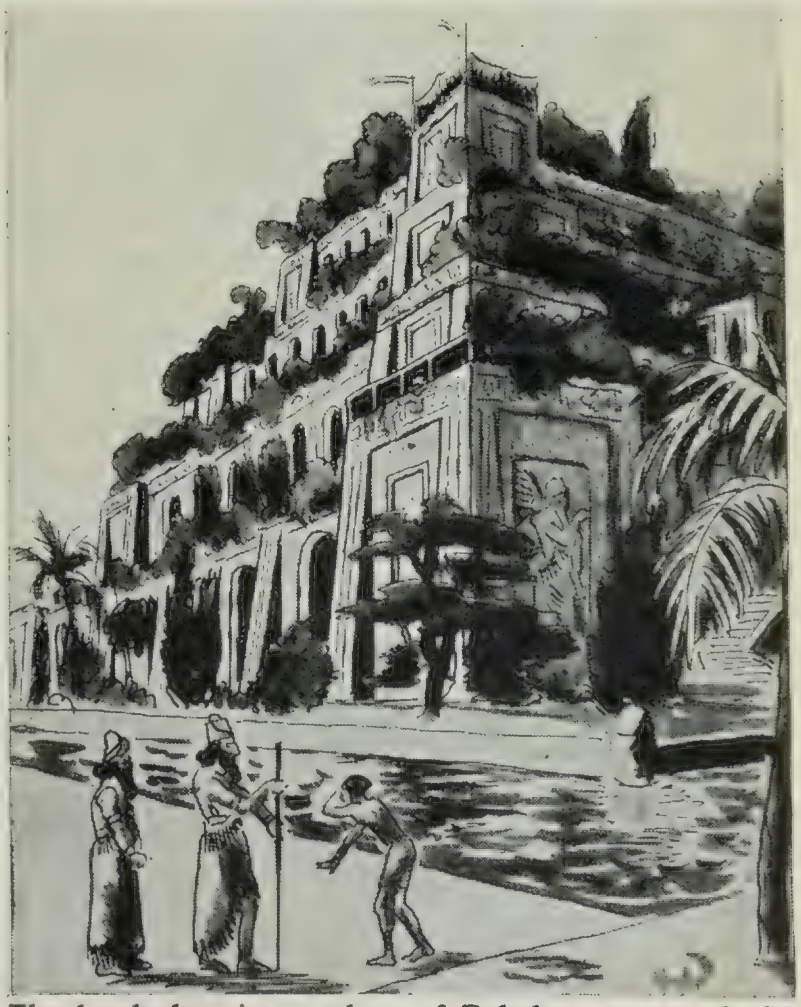
This was the masterpiece of Pheidias and the finest and truest conception of the Greek religion. According to all those ancient writers who have left us their impressions, it was the supreme expression of beauty and majesty.

Unfortunately this splendid statue no longer exists and we know of it only through writings, and from a few coins on which it was reproduced; for it was destroyed in the 4th century A.D. at Constantinople, whither it had been taken, in a great fire.

ENCHANTING GARDENS OF FAIRY-LIKE GRACE

ABOUT fifty miles from Bagdad, on the bank of the river Euphrates, may be seen the ruins of a very, very old city which was once one of the great cities of the world and which attracted visitors from every country, for it was a city of wonders; its name, which means "Gate of God," is Babylon. Nebuchadnezzar, of whom you will have heard in learning the Old Testament, was the king of Babylonia for forty-four years, from 604 to 561 B.C., and he it was who rebuilt the city of Babylon so that it became a kind of dream-city, too beautiful almost to be real. In it were numberless wonderful things, but the most marvellous of all were the Hanging Gardens of Babylon which held a place among the seven wonders of the world. Amytis, the Queen of Nebuchadnezzar, came from a mountainous country and she missed the hills and valleys of her own home, for the country of Babylonia is very flat; so the king, in order to make her happy and at home in her new surroundings, had these magnificent gardens constructed in his palace grounds. Diodorus, the Greek historian, and Strabo, the Greek writer on geography, have given descriptions of the gardens, which are unique in the history of the world.

These gardens appeared to be magically suspended in mid-air, for they were built one over the other and the lowest was placed high above the ordinary level of the ground, each one being supported on the very top of a series of arches, some of which were as high



The lovely hanging gardens of Babylon were made by Nebuchadnezzar for his queen, who was fond of beautiful surroundings. Their beauty suggests a glimpse of fairy-land.

as seventy-five feet. The extent of the gardens was about four acres and in shape they were square. Deep plates of lead in the arches contained enough soil to grow huge forest trees, and the flowers and plants were watered from a reservoir built at the top of the highest garden, the water for which was obtained by means of a screw from the Euphrates. One could look down from these heights on to the city of Babylon below, to the river Euphrates winding its course through the heart of the town, and on to the country all round.

THE WONDERFUL PLEASURE-GROUNDS WHERE THE KING AND QUEEN SPENT THEIR LEISURE.

In every garden were several terraces, marble and mosaic-worked banqueting rooms filled with palms, rhododendrons and sweetly-scented flowers, and round the walls hung paintings of mythological subjects, while special enclosures, wherein music and dancing could be performed daily, were not lacking. In the centre of large, velvety lawns were curiously shaped lakes, sometimes made so as to form the initial letter of the name of King, or Queen, or other important person, and swimming pools, in which the water was artificially coloured, red, gold, blue or any particular shade desired, to match the tiled paths inlaid with intricately patterned enamel work.

The gentle rhythm of falling water from cool fountains and the grander sound of foaming, rushing, water from artificially constructed waterfalls were provided in many parts of the grounds. Innumerable birds sang enchanting songs, and in glass-houses, furnished with luxurious couches and rugs, one could feast one's eyes on the gorgeous colouring of the humming bird, the paradise bird and the other lovely natives of tropical lands. Statues in marble and stone, expressing the religion of the country and recalling various historical episodes of great importance, were scattered throughout the grounds, usually in prominent positions.

Wide avenues of trees, lime-trees, ilexes and pines, and groves of palms, cedars, and cypresses, together with the large Cilician silver fir, afforded protection from the brilliant sunshine. At the sides, and sometimes in the middle, of the wide stretches of lawn were flower beds with gorgeously coloured orchids and fuchsias and other flowers, such as roses, chosen for their scent as well as for their perfection of form, so that the sight should be delighted with the beauty of colour and form and the sense of smell be satisfied with the odours carried by the breeze.

A PROFUSION OF FRUIT AND FLOWERS FLOURISHED IN THE BEAUTIFUL HANGING GARDENS.

Along the walls trailed green vines with huge black grapes tempting the onlooker to pick them, while olives and melons grew in abundance. Clumps of date-trees were not scarce and raisins, even after the slaves and the birds had taken their share, still remained heavy on the boughs. Trees on which hung large, juicy lemons, to provide cooling drinks, had been planted at intervals all over the gardens.

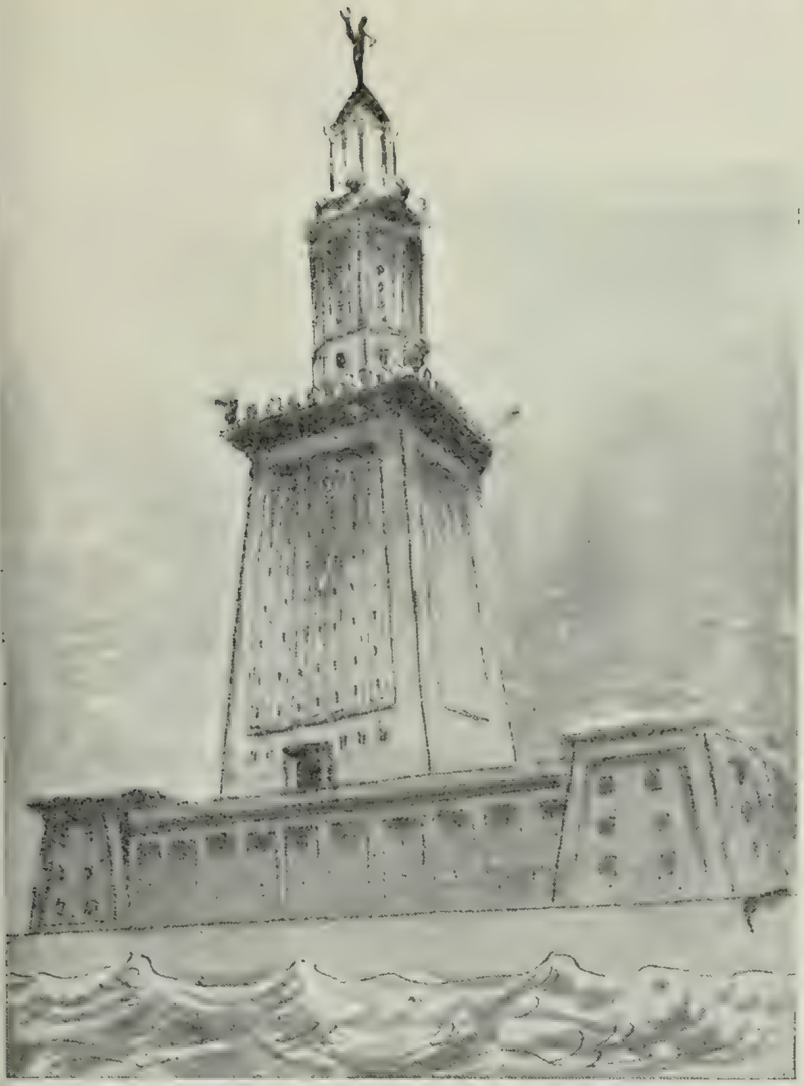
In this fairyland, the gracious gift of a king to his queen, Amytis spent her leisure hours of each day and here, when his state affairs for the day had been completed, did Nebuchadnezzar come to tell yet once again the tale of his love.

THE ROMANCE OF THE FIRST LIGHTHOUSE

ALEXANDRIA, the chief seaport of Egypt, is named after Alexander the Great, who was its founder. Having decided that this place was ideally situated for a harbour and a wealthy town, he sent for Dinocrates, the distinguished Macedonian architect, who had just finished the beautiful temple of Artemis at Ephesus, and asked him to draw up plans for the building of a town on this site, and through this work Dinocrates won increased fame. Pharos was then a small island separated from the mainland, but Dinocrates, by erecting an artificial dyke which extended for nearly one mile, joined it to Egypt.

Now one of the best pupils of Dinocrates was Sostratus of Cnidus, who had already made his name in his native town by erecting a colonnade upholding a terrace which could be used as a promenade, and he it was who, under the influence of the Macedonian architect of Alexandria, constructed the marvellous lighthouse at Pharos.

It was a tragedy that led to the building of the first lighthouse. Sostratus desired to marry a lovely Athenian maiden and when the time for the wedding had arrived the girl, together with her parents, set out to cross the piece of water separating Greece from Egypt. As they approached Egypt the sea, which up to then had been quite calm, became very rough and the pitch darkness of the night prevented them from seeing ahead; neither could those



The first lighthouse, built near the Isle of Pharos, by a broken-hearted youth, Sostratus, whose bride was lost at sea. It acted both as a memorial and a beacon light.

on land, who heard their cries of distress, help them in any way. When the dawn came Sostratus and his relatives found that his bride and all who had accompanied her had been drowned, for the ship had struck against some terrible rocks and been broken to pieces. Sostratus was so overcome with grief that he gave up doing his work and passed his time in sighing and weeping over the event.

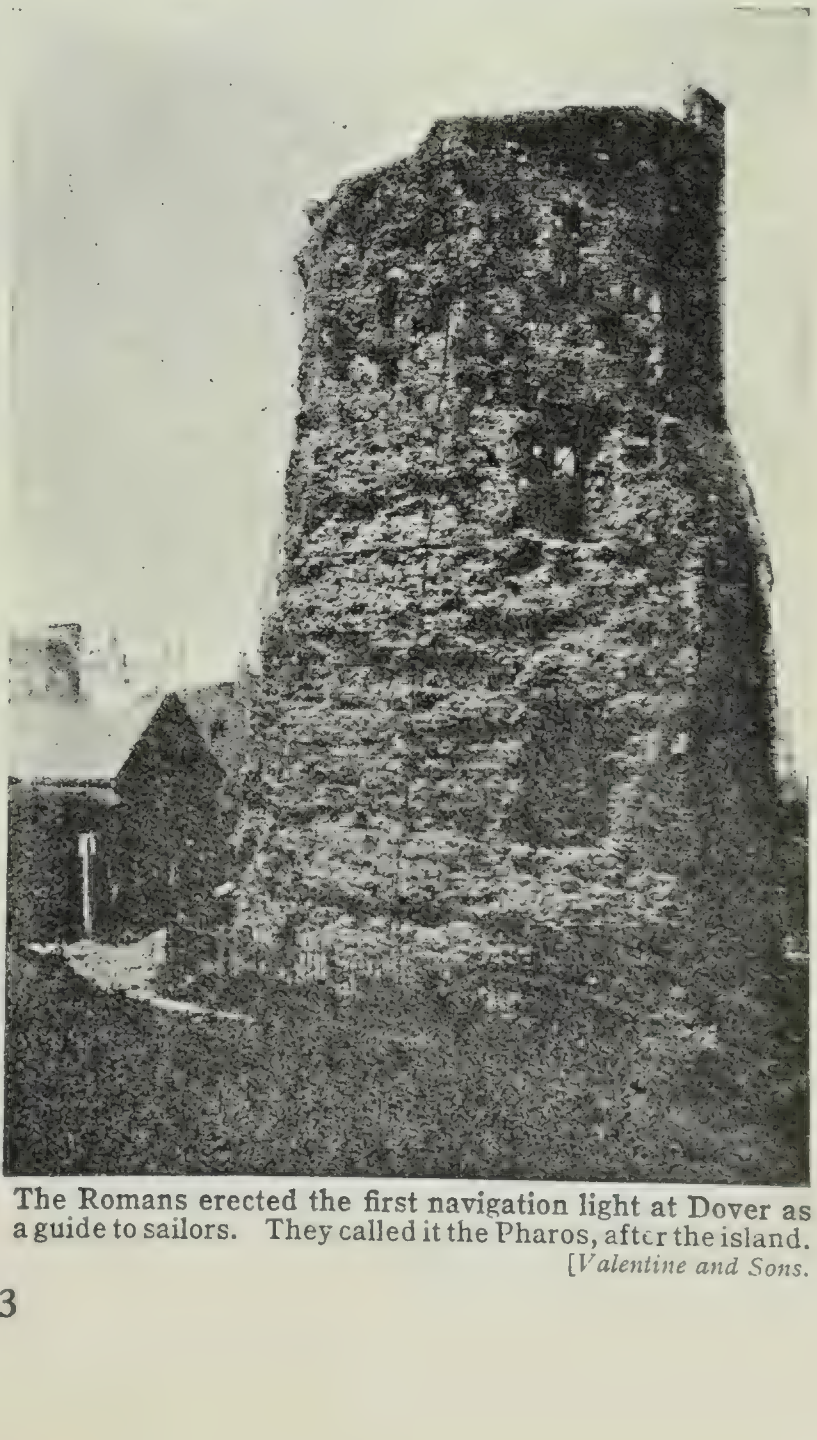
SOSTRATUS BUILDS A TALL WHITE TOWER AS A MONUMENT TO HIS LOVE.

Some months later Dinocrates, his beloved friend and master, suggested to him a way by which he could give concrete expression to his sorrow and at the same time prevent a shipwreck occurring a second time. And the idea conceived by Dinocrates was to build a tall white tower on the island of Pharos from the top of which flames would show to those on the sea the rocks and dangerous shoals near the coast. So Sostratus, very pleased with this suggestion, set to work to plan not only a beacon for boats but also a monument worthy of his Athenian love. The reigning Ptolemy, for Alexander the Great was now dead, took an interest in the undertaking and told Sostratus not to allow the cost to deter him from making it as beautiful as possible.

The site chosen was at the eastern end of the Isle of Pharos by the entrance to the harbour. According to old records the structure was four hundred feet high and consisted of several storeys, each one narrower than the preceding one, the higher ones having windows looking towards the sea, out of which large flames and torches lit up the surrounding parts during the night. An iron basket, fixed in a specially shaped hollow on the top storey was used for the fire, the men who attended to the fire thus becoming the first lighthouse keepers. The shape of the building was square, and the material used was pure white stone. That the best materials and workmanship were employed is proved by its enormous cost of eight hundred talents, that is, about £150,400 in English money.

ILLUMINATED TOWERS WHICH MAKE SEA-TRAVEL SAFER.

It remained as a guide to sailors for close on fifteen hundred years and then, in the fourteenth century, it was wiped out by an earthquake. Owing to its great usefulness the idea was copied by other nations, and in



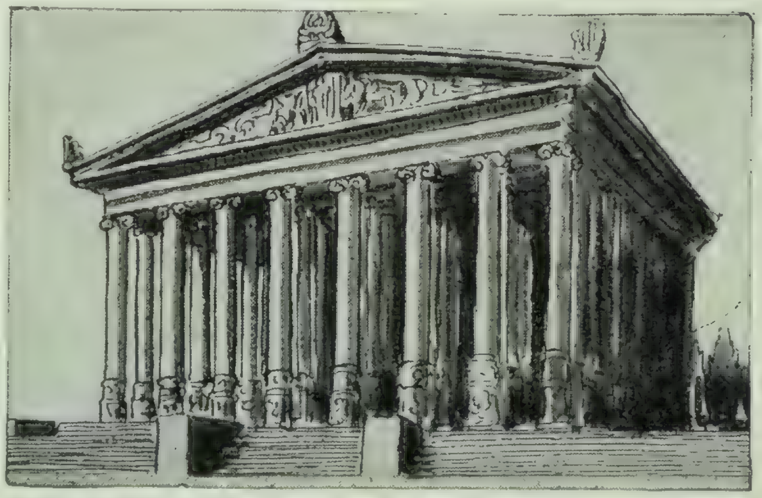
The Romans erected the first navigation light at Dover as a guide to sailors. They called it the Pharos, after the island.
[*Valentine and Sons.*

due course most treacherous coasts were made safer for ships by the erection of these illuminated towers.

Instead of being called a tower, the name of "pharos," from the island on which it stood, was given to it, and this became the ordinary Greek term for a lighthouse. In French the word in use is "phare," while the two forms of "phare" and "pharos" are current in English to-day, so that in this way the work of the builder of the first lighthouse, considered as one of the great wonders of olden times, is kept alive in our modern world. If you have been to Dover Castle you will have seen the ancient tower there, dating from Roman times, and used in olden days as a lighthouse. It is known to-day as the "pharos," and thus reminds us of the love of Sostratus, and of the first lighthouse, away at the mouth of the Nile.

THE TEMPLE OF DIANA THE HUNTRESS

ARTEMIS, the Greek name for the goddess known as Diana by the Romans, was the daughter of Zeus (whose great temple was at Olympia) and Leto, the daughter of Coeus and Phoebe and the twin-sister of Apollo. The Greeks looked upon her, not as the swift huntress and the supreme type and patron of all chaste maidens (which was the Roman idea of her) but, according to the Oriental conception, as the goddess of all nature, the mother of every living creature, from whom came the fruitfulness of all the earth. Her statue at Ephesus, worshipped by her followers, had therefore many breasts, these symbolising the power to bestow life and fertility.


The temple of the goddess Diana, daughter of Zeus—a magnificent building of gigantic columns and colourful designs. This shrine was one of the wonders of the world.

The splendid temple of Artemis, which was numbered among the Seven Wonders of the ancient world, was at Ephesus in Asia Minor, and gave to this city, the chief of the twelve Ionian cities, an especial importance and the name of "Warden of the Temple of Artemis." Vast numbers of people from every part of Asia assembled there to keep the festivals of the goddess.

The magnificent edifice was situated in the wide plains about one mile outside the city gates. The architect was the well-known Dinocrates, for it was the period of Alexander the Great's reign, and all the twelve Ionian cities joined together to defray the cost of the undertaking. From the works of Pliny the Elder and other classical writers we know something about it, and one fact they all stress is its great size. The excavations made by Mr. John T. Wood, in the last century, show that it occupied eighty thousand square feet of ground.

Large grounds, with long avenues and thick groves of spreading trees, surrounded the shrine, and walls on each side marked its boundaries.

In width the temple measured about one hundred and sixty feet and the length was three hundred and forty-two and a half feet. It was more on account of its gigantic proportions than its artistic beauty that it was considered so wonderful.

In style it took a place among Ionic buildings; that is, it had the intricate entablature (the part supporting the roof and resting on the columns) the voluted capitals, and the columns with bases which were features peculiar to Ionic architecture, rendering it much lighter and more graceful than the heavier and more majestic Doric type. Each side had twenty columns and the back and front were upheld with eight; the total number in the structure amounted to as much as one hundred. The thickness of every one of these columns was six feet and in height they were over sixty feet. The bases of all these columns were adorned with rings of gold, and thirty-six had been sculptured with life-size figures for about twenty feet from the ground. Portions of these columns have been discovered by Mr. Wood and the sculptured drum of one is now in the Ephesian Gallery of the British Museum, in London. Very likely the king, and different states and private people, gave one or two columns each as an offering to Artemis.

The mouldings of the columns and entablature were done in blue, red and gold, and mostly with designs worked on them, showing some historical or mythological scene familiar to the people. Honeysuckle, a favourite design with the Greeks, and lions' heads were two of the patterns used to ornament the mouldings. Large white marble tiles covered the roof, and the doors were decorated with gold and ivory. The stylobate (the floor on which the columns stand) consisted of fourteen steps, which was above the usual number. The cella, the main part of the temple, was probably open to the sky (there may have been an opening in the roof as in the Pantheon at Rome), and it was exceedingly rich in votive offerings in gold, silver, and ivory, and in paintings and sculptures representing the finest work of the best artists and sculptors of the time.

THE GREEK TEMPLE WHICH WAS THE DWELLING-HOUSE OF A GODDESS.

The walls were beautified with large paintings and the entire chamber gave the effect of warmth and light, for it is very important to remember that all Greek temples were lavishly decorated with deep, gorgeous colouring, the Greeks being lovers of colour and experts in producing harmonious, lovely effects.

At the end of the cella there was the altar to Artemis and behind this stood her statue. This image was believed to have fallen from heaven, and to it the safety of the city on two perilous occasions was attributed. Probably it was really a stone or piece of matter which had fallen to earth from the pressure of the atmosphere, and which had been found by some sculptor and roughly shaped into the form of a woman. By the Greeks the temple was thought to be the actual dwelling place of the god or goddess. The statue represented the actual presence of the deity, and for this reason great labour and time were given to the temples. It was this too that caused the concealment of the statues by a curtain (on ordinary days) in certain places, for the Hellenic people looked upon this as a sign of reverence to their deity.

THE REMAINS OF THIS MAGNIFICENT STRUCTURE NOW LIE IN FRAGMENTS IN OUR MUSEUMS.

Xenophon, the Greek soldier and historian, in his " Anabasis," states that the temple was used as a safe for the treasures belonging to the city and to private residents. No arms or fighting were allowed inside these walls ; it was a place of peace and safety ; and all in need of shelter fled there to claim full protection, for no one could be taken prisoner while under the protection of Artemis.

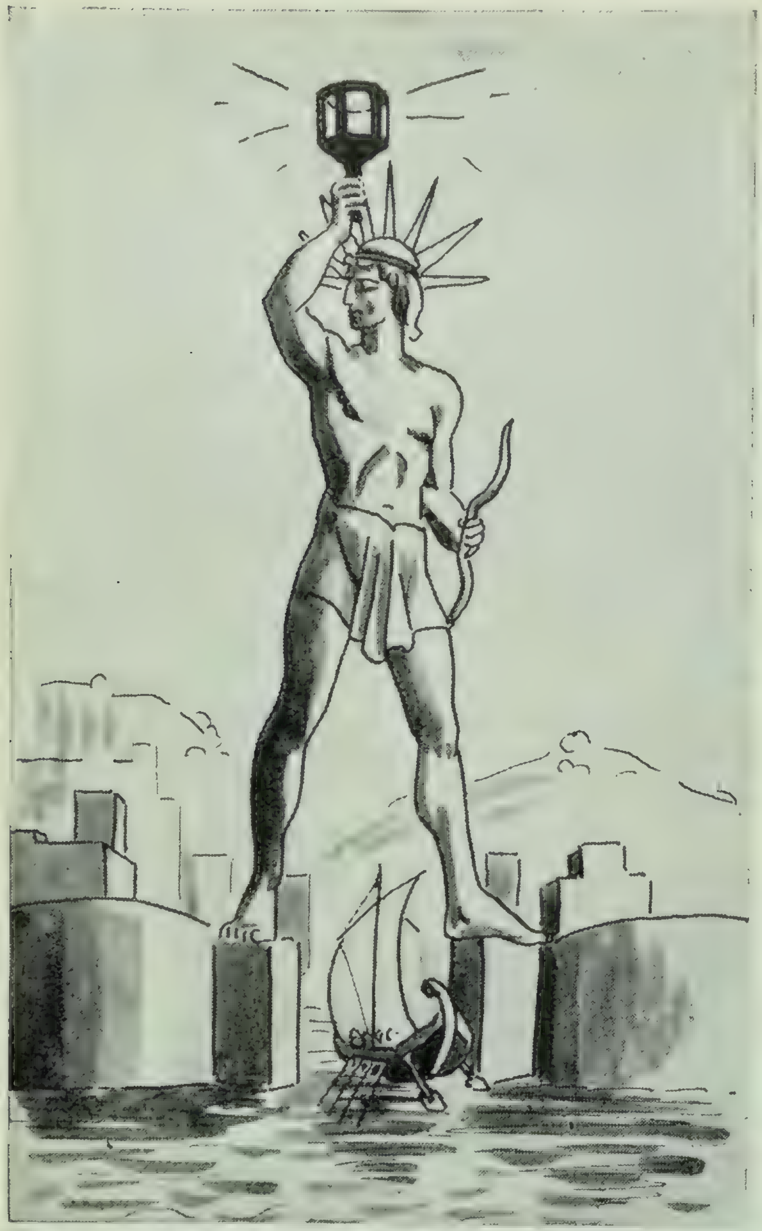
The Goths partially demolished this edifice in the middle of the third century A.D., and twenty years later the Christians, intending to build a Christian church there, completed the work, but the church was never carried out, for an earthquake destroyed the materials which had been brought for the new building and buried the whole of the old structure deep in the earth, where it remained until about sixty years ago, when, after a search of six years, it was discovered, and the fragments given to various museums (among them our own British Museum in London), where they can now be seen.

THE BRONZE GIANT WHO GUARDED A HARBOUR

HAVE you ever wondered how the adjective " colossal " found its way into our language ? All words, you know, have a life of their own and they develop just as human beings do, and this word " colossal " is very old now, for it has lived, in various forms and countries, for over nineteen hundred years ! It has come from the noun " colossus," which the Greeks and Romans used to describe any statue which was larger than an ordinary man. Up to the birth of Christ there were many such statues ; well-known ones were the Apollo of Calamis and his Apollonia ; the statues of Jupiter and Hercules at Tarentum, carved out by Lysippus ; and the statue of the goddess Athena at Athens, the Athena Promachus on the Acropolis, and the Olympian Zeus, all of which were by the celebrated sculptor Pheidias. But the greatest of all these came to be known simply as the " Colossus of Rhodes."

IN HONOUR OF THE SUN-GOD, THE FAMOUS COLOSSUS WAS ERECTED.

Rhodes, which was famous as a centre of painting and sculpture, is the most easterly island of the Aegean sea and near the south coast of Caria, and it was here that this gigantic statue was set up. The inhabitants desired to honour the sun-god, Helios, who, according to their beliefs, gave light to gods and men. He was worshipped in many parts of Greece, but especially at Rhodes, which island was dedicated to him and yearly held games in his honour. In order to raise money for this purpose the people sold the engines which Demetrius, called Polior-



The colossal statue which acted as a beacon to guide ships safely to harbour, and which ended as scrap metal.

cetes, "the besieger," left behind when he abandoned the siege of their city which he had been unable to conquer, and with the amount thus obtained it became possible to carry out their wish.

Chares of Lindus, who lived in the third century before Christ, was selected as the sculptor and he spent twelve years in making this huge statue. It was done in bronze and it must have looked very impressive under the clear blue sky and with the rays of the sun full on it! The cost was about £243,755 (thirteen hundred talents) and it is not surprising if we consider the size of the work, which stood one hundred and twelve feet from the ground and was wide in proportion to the height. When we think that one finger of this idol was bigger than the whole figure in most statues and that few men had arms long enough to reach round its thumb, we are able to imagine its colossal proportions.

It was put up at the entrance to the harbour, looking out over the blue Aegean sea, and it must have been visible to ships very far from the land. Although we do not know for certain the attitude in which it was posed, tradition says that Chares arranged it with one leg on each side of the harbour, so that all ships going in or coming out would have been obliged to pass between its legs, and in the right hand it held a beacon light.

HOW THE MIGHTY STATUE OF RHODES ENDED ITS DAYS.

The idea embodied in this work was of the dominion of Helios over the island and the Rhodians; of his fearful majesty and all-powerful rule; of his care for those devoted to his worship and of his capability to ward off all enemies from the place wherein he had chosen to dwell. This conception and the age-long fame of the Rhodes Colossus may be seen from Shakespeare's play, *Julius Caesar*, in which occur these words of Cassius to his friend, Brutus:

> "Why, man, he doth bestride the narrow world
> Like a Colossus, and we petty men
> Walk under his huge legs."

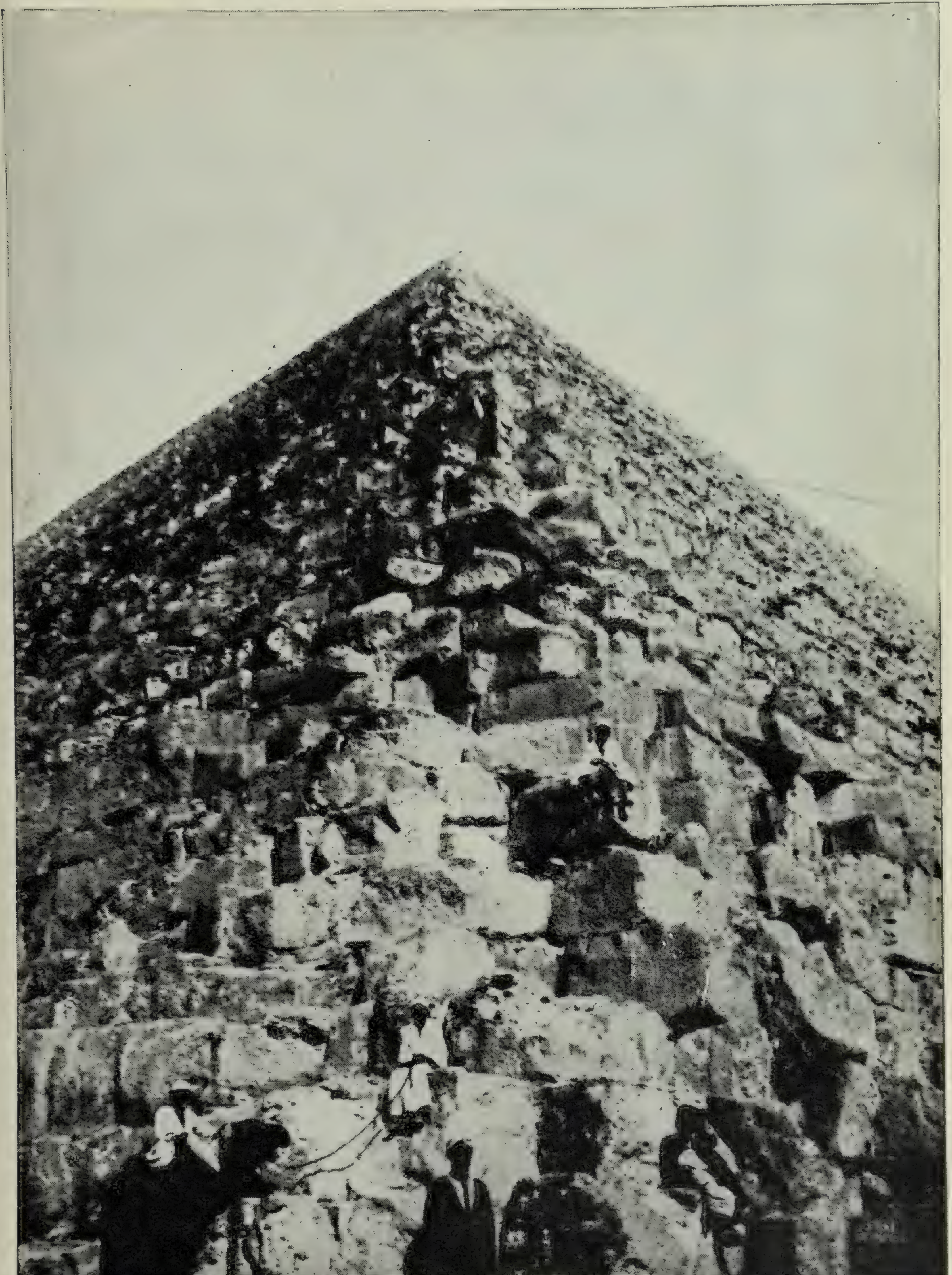
It is sad to think that such a costly piece of work should have lasted only about sixty years, but so it was; for about 200 B.C. an earthquake ruined it and during nine hundred long years the fragments remained on the ground as they had fallen. Finally some Saracens bought them to melt down for scrap metal and war engines. No less than nine hundred and eighty camels were necessary to take away the debris, from which you may realise the truly colossal size of this wonder of ancient days. But, though it has long since been destroyed it is still remembered as one of the marvels of the world.

THE PROUD PYRAMIDS OF AGELESS BEAUTY

OF the Seven Wonders of the ancient world only one, but that one the greatest and oldest of them all, has survived the destroying effect of time and the ever curious, ever grasping hands of man, so that even to-day one may go to see it, and this wonder is the Great Pyramid of Cheops.

Cheops, or Khufu, which is nearer to the Egyptian form of his name, was an early king of Egypt who ruled the country for fifty years in about 4700 B.C. He was the builder of the greatest of the pyramids, and it is on account of this mausoleum, which, since its erection, has been universally acknowledged to be the

A NEAR VIEW OF THE GREAT PYRAMID



In olden days the surface of the Pyramids was quite smooth, but gradually the outer stones have been removed for building purposes. To-day Arabs can run up and down the rough stones with the agility of monkeys.

largest and most perfectly constructed building ever set up by man, that Cheops will never cease to be remembered.

THE "GREAT GODS" LIE SLEEPING UNDER THE EVERLASTING PYRAMIDS.

Gizeh is a village about ten miles from Cairo, and opposite it is a piece of desert land, not one mile in breadth, and in this small stretch of ground may be found all the pyramids and tombs of ancient Egypt. It is one of the most fascinating spots in the whole world.

The marvellous fact about the construction of the pyramids is that, with the exception of the passages and chambers, they are *absolutely solid*; although in our times we use very powerful and intricately made machines we would not be able to make a pyramid as perfect as those built sixty-six hundred years ago.

Sand has been blown by the wind against this huge structure for six thousand years and still it stands a perfect pyramid, towering above the plain.

Among the ancient statues of Egypt is the Sphinx, a recumbent man-headed lion. The great pyramid of Cheops is towering in the background.
[*Photochrom Co., Ltd.*

No modern work can equal the skill shown in the joining of the stones with mortar, which is one of the remarkable points of the pyramids; the joints are almost invisible and the effect is of a very smooth surface.

At the eastern side of every pyramid there was always a temple in which the dead king was worshipped, for the Egyptian religion included the acknowledgment of their kings as gods, and the title of "Great Gods" was given to them. The site of the temple in Cheops' Pyramid is known from the pavement and blocks of granite to be seen on that side of it.

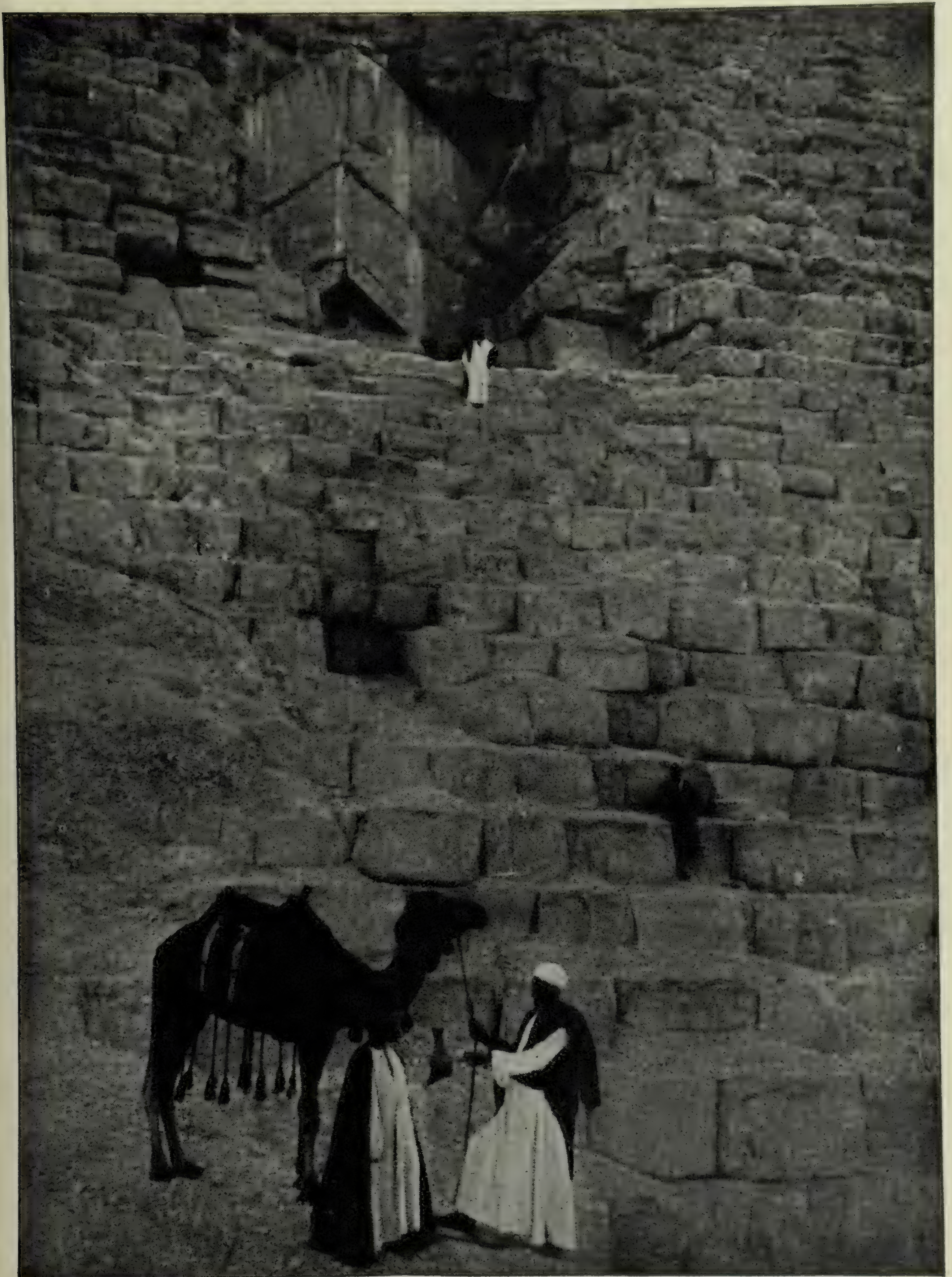
AFTER MUCH LABOUR, GIGANTIC STONES WERE QUARRIED TO BUILD THE PYRAMID.

The Great Pyramid covers nearly thirteen acres (each of its sides was seven hundred and sixty four feet in length at the bottom), and it stood about four hundred and eighty feet (now it is four hundred and fifty feet) from the level of the ground. The weight of the masonry used in building it is estimated to have been more than seven million tons; and two million three hundred thousand blocks of stone, each stone weighing two and a half tons, went to its construction. If you realise that in the base measurements of its four sides there is no more than two finger-breadths of difference, you will have a clearer idea of the exact proportions of this mighty monument of ancient Egypt.

No records tell us how these gigantic stones were transported from the quarries to the pyramid, nor how they were lifted into position.

Herodotus, the historian, tells us that one hundred thousand men were employed during three months of the year in bringing the stones to the pyramid, and that the months chosen for this work were those when the river Nile flooded the land. Probably the stones were floated across the swollen river on rafts, for the quarries were on the opposite side to the pyramid. The same writer sets forth the suggestion that the blocks of stone were carried from the

THE ENTRANCE TO THE GREAT PYRAMID



A near view showing the rough, age-worn stones of the entrance to the Great Pyramid, which, almost hidden, lies behind the native near the top. Some idea of the size of the stones can be gathered by comparing them with the native.

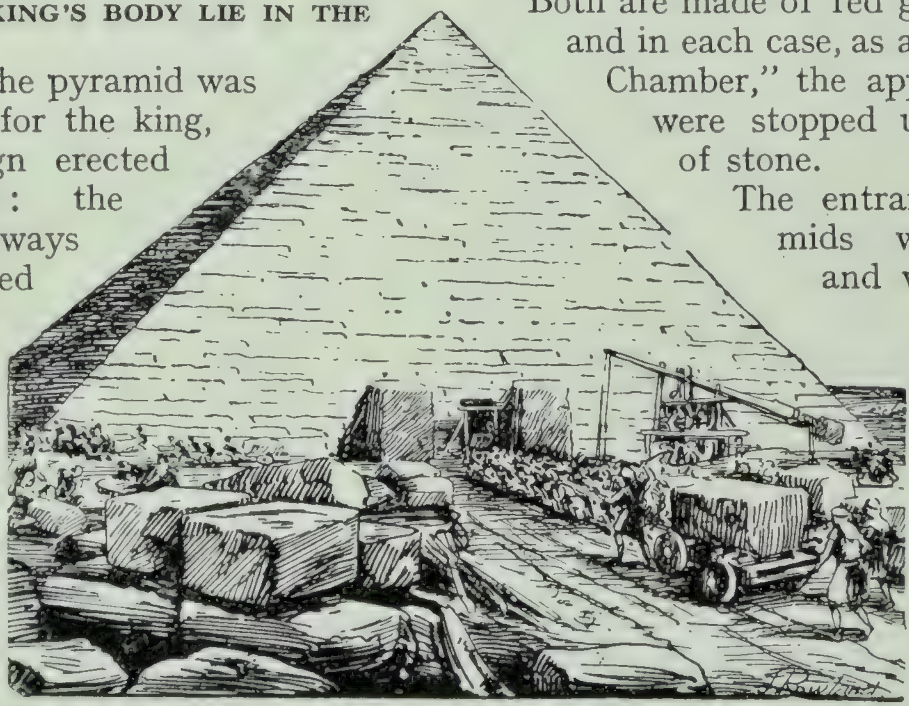
river-bank to the bottom of the pyramid over a stone ramp, or slip-way, which, he says, took ten years to make.

Besides these 100,000 men, 3500 to 4000 masons and skilled workmen were permanently employed during twenty years to erect this colossal house for the spirit of Cheops after death.

Rough-hewn blocks with an outer casing of fine, white, polished limestone were used for the outside part and for the interior passages ; while basalt, granite and diorite have been selected for most of the chambers and decorations. All these kinds of stone, in abundant quantity and of excellent quality, could be obtained from the quarries near by.

WHERE DID THE KING'S BODY LIE IN THE PYRAMID ?

The purpose of the pyramid was to provide a tomb for the king, and each sovereign erected one for himself : the Egyptians always wished to be buried alone and far away from other tombs, and they were afraid, too, of thieves breaking open the burial place for treasures of any kind. Thus the very heart of a pyramid was the burial chamber, which was always placed low down, generally below the level of the ground, and a passage from the north side led to it. The whole interior was cleverly arranged to hide the coffin from everyone except relations and the priests. In Cheops' Pyramid the entrance passage goes down three hundred feet into the earth, far beneath the base of the monument, into the underground room, and upwards, after a short descent, to the most important, known as the " King's Chamber." A door, which is only three and a half feet high but is ten feet thick, is the only entrance to the latter. You can imagine that it is not an easy matter for anyone to get past such a low door !



Workmen and slaves laboured hard to build the pyramids. One hundred thousand men were engaged in the work of carting stones.

The walls, floor and ceiling of this chamber are all of red granite and so is the only object remaining there—the coffin in the centre. In ancient days there was inside the granite coffin a wooden coffin containing the body of the king. Measurements of the granite coffin prove that it was put into the chamber before the roof was built, because the door is far too narrow to allow of its being taken through. It is impossible to take it out of the room now and so after all these hundreds of years the wish of Cheops that his coffin should never be removed is still carried out.

HOW WAS THE KING'S BURIAL CHAMBER PROTECTED FROM COLLAPSE ?

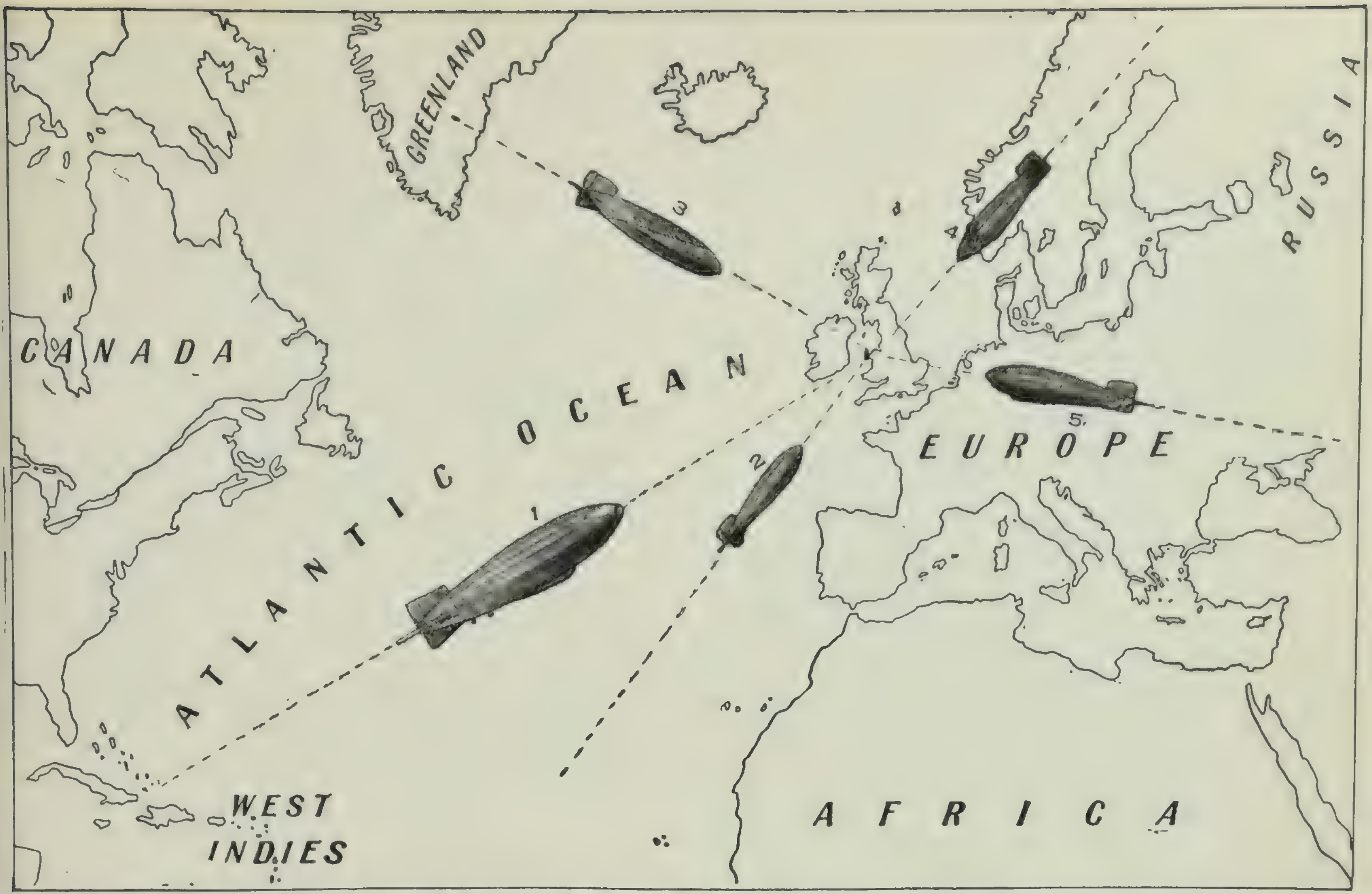
Lest the structure might give way and fall on to the coffin five rooms and a ceiling are provided above it. The Queen's Chamber, sometimes thought to have been intended for the wife of the king, and the Ante-Chamber are two other important rooms in this pyramid. Both are made of red granite throughout, and in each case, as also in the " King's Chamber," the approaching passages were stopped up by plug-blocks of stone.

The entrances to the pyramids were, intentionally and with complete success, hidden for some hundreds of years ; neither do we know with any certainty what provision was made for those having right of entry. Very likely there were movable stone doors, for we are told of a stone that may be taken out and when lifted up will give access to the basement. This would appear to be a trap door.

WHY WERE STATUES AND HOUSEHOLD ARTICLES PUT IN THE TOMBS ?

Statues and pottery, in diorite (which is mainly composed of quartz) and alabaster, and sometimes in granite and limestone, all of which were beautifully carved and nearly always coloured, too, were very numerous inside these vast sepulchres. The Egyptians believed the life after death required many of the things they needed in this life.

This huge structure, lying in the yellow sand under the burning sun and vivid blue sky of Egypt, seems to be still the most lasting and most wonderful of all the works which man has produced ; it is, as it were, an everlasting challenge from man to his great and unwearying enemy, old Father Time !



Here are shown vast imaginary airships bringing our weather to us. No. 1, the largest, carries frequent storms across the Atlantic: No. 2 brings fine weather from the south: No. 3 is loaded with the biting winds of winter: No. 4 has warm weather for us in summer and intense cold in winter: No. 5 carries "seasonable" winter weather and cool settled weather in summer.

WHAT WILL THE WEATHER BE?

Nowadays the foretelling of to-morrow's weather is an easy matter. This chapter will tell you how it is possible to know with certainty what weather is on its way to our islands, and will describe how weather forecasts are obtained.

HOW many of you boys and girls ever think of what the weather means to us? Has it ever occurred to you that it affects our lives in hundreds of ways! To realise this, it is only necessary to consider a few simple cases.

The farmer's work is controlled by the weather, and bad weather means bad crops, while bad crops mean higher food prices. The prosperity and happiness of the people who attend to our wants when on holiday depend on the weather. As well as spoiling *our* holiday at the seaside, the bad weather means that the people who work for us there find little to do. Again, wet weather, as well as snow and fog, increases the cost of running trains, and so on.

The little disappointments which we meet *ourselves*, mean even more to us. The gay summer dress almost ruined by a sudden downpour, the cancelled picnic and the postponed cricket match *do* make us feel annoyed. If we just think for a moment, we can see how the "Clerk of the Weather" can affect our lives at every turn.

"Of course," you say, "but we cannot change the weather, so why worry?" The trouble is that all of us *do* worry at some time or another, and we can't help it! What would we not give before some special event just to know what the weather is going to be? We must admit that if we cannot change the weather, it is useful to know what kind of weather is coming.

But we are not the only people who find this information most useful. The farmer wants to know whether he is going to have dry weather to work in his fields. The fisherman must know when to expect a change in the weather, for if he were overtaken by a bad storm at sea the consequences might be very serious indeed. The coming of aeroplanes has further increased our desire to know more about the approaching weather. An airman caught in a bad storm, or in a fog, has a most trying and dangerous time.

In times past, people often watched the movements of animals and birds to discover what kind of weather was coming. Bats flying in restless fashion in the evening, toads appearing at sunset, black snails crawling across the roadway, or trout rising frequently in the neighbouring stream—all show changes in the weather.

We may even have heard people say that rain was coming when they saw Madame Puss washing behind her ears. Even to-day, the farmer and fisherman look at the sky, and note what they see there and the direction of the wind. From these signs they form their own notions about the approaching weather—and they are seldom wrong.

But when father wants to know about to-morrow's weather, he does not watch the cat. Nor is he always able to ask the local fisherman or farmer. Father either " listens-in " or looks at the weather map in the newspaper. Now, how is he able to get the information he wants in this way? This is the most important question we have to answer, but before we can do so we must understand where our weather comes from first of all.

WHAT ARE THE WEATHER FACTORIES, AND WHERE ARE THEY?

To help us to form some true idea of where those distant " weather factories " lie, let us rise to some tremendous height in an aeroplane and let us make-believe that we can see the whole world beneath our plane. Away to the north-west, over icy Greenland, lies a great belt of settled weather. From this cold country, in winter, comes some of the frosty weather which we hear described as " seasonable "—and this we usually enjoy. In summer, Greenland usually sends us cool weather. Indeed, we have not so very much to say against Greenland so far as the weather is concerned.

But if we look away across Scandinavia, and to the vast Siberian plains beyond, we see where the real cold wintry weather comes from. Here, in winter, is a great icy storehouse of cold which sends us our most terrible winter weather, brought by the bleak east winds.

" When icicles hang by the wall,
And Dick the shepherd blows his nail,
And Tom bears logs into the hall,
And milk comes frozen home in pail."

But in summer, should the east winds blow from Scandinavia, we have something very different. They are the same winds, but now they blow hot instead of cold. No longer do we want to pile clothes on as in winter, but we don our lightest and gayest attire.

Now let us look away to the south-west. Far across the Atlantic between the American coasts on the west and the African and European shores to the east, is another immense zone of steady weather.

BE PREPARED! THE WEATHER-GLASS WARNS US OF COMING SQUALLS.

But to the north side of this steady belt there is a vast region, which includes the British Isles, where the weather is in a state of constant change. A map illustrating this is on page 256. To the west of this zone of changeable weather, the Titans of the Air fire their great storm guns day in, day out. Sometimes their vast projectiles of cloud and rain miss the British Isles. But numbers hit our small islands with an aim uncomfortably sure.

But " to be fore-warned is to be fore-armed " and when we know that storms are coming, we can be prepared. Now we are ready to discover how this is done.

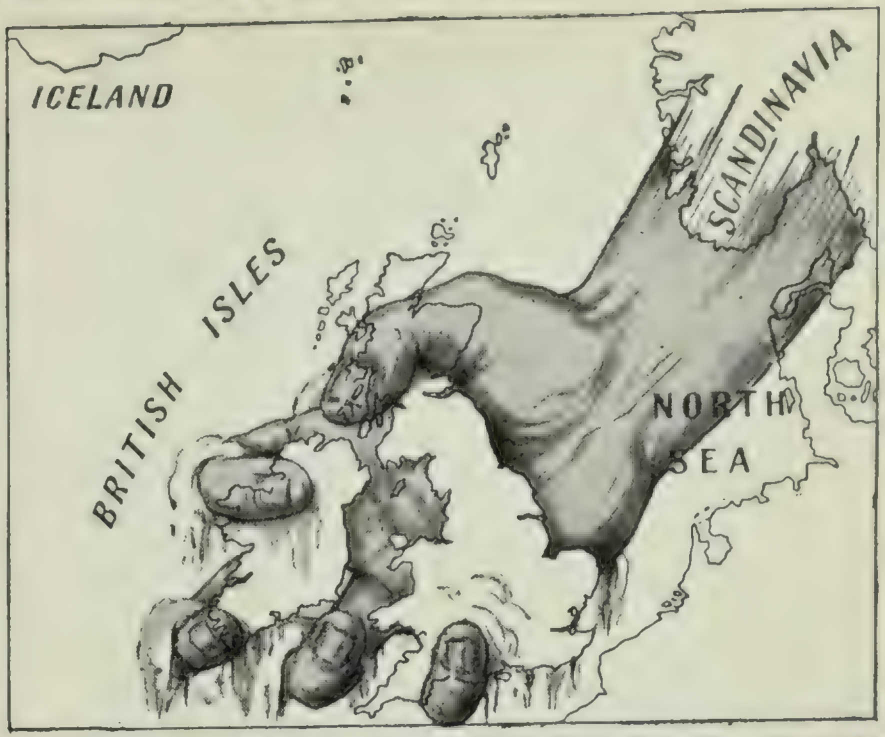
At a great many places in the British Isles there are stations where instruments are kept for observing the weather. These observation posts number forty-six in all, and the observations made at these stations make it possible to " forecast " the weather.

Many different kinds of instruments are used to observe weather conditions at these stations, where experts are continually watching the instruments and receiving reports from other stations. We shall only discuss the most important of the weather recorders, and begin with the barometer, the principal instrument used.

Most of us are familiar with an instrument similar to the barometer used by the weather experts—the homely " weather-glass." How often have we heard father say " The glass is high this morning," or " The glass dropped overnight." We have often looked at the glass ourselves and noticed whether the pointer was set at " Rain," " Change," " Fair," etc.

WHAT IS A BAROMETER, AND HOW DOES IT WORK?

But yesterday it may have been raining and, in spite of repeated tappings, the glass insisted in pointing to " Fair." One lovely sunny morning last June it pointed to " Rain " and what a glorious morning it was! No wonder you have often left this curious instrument



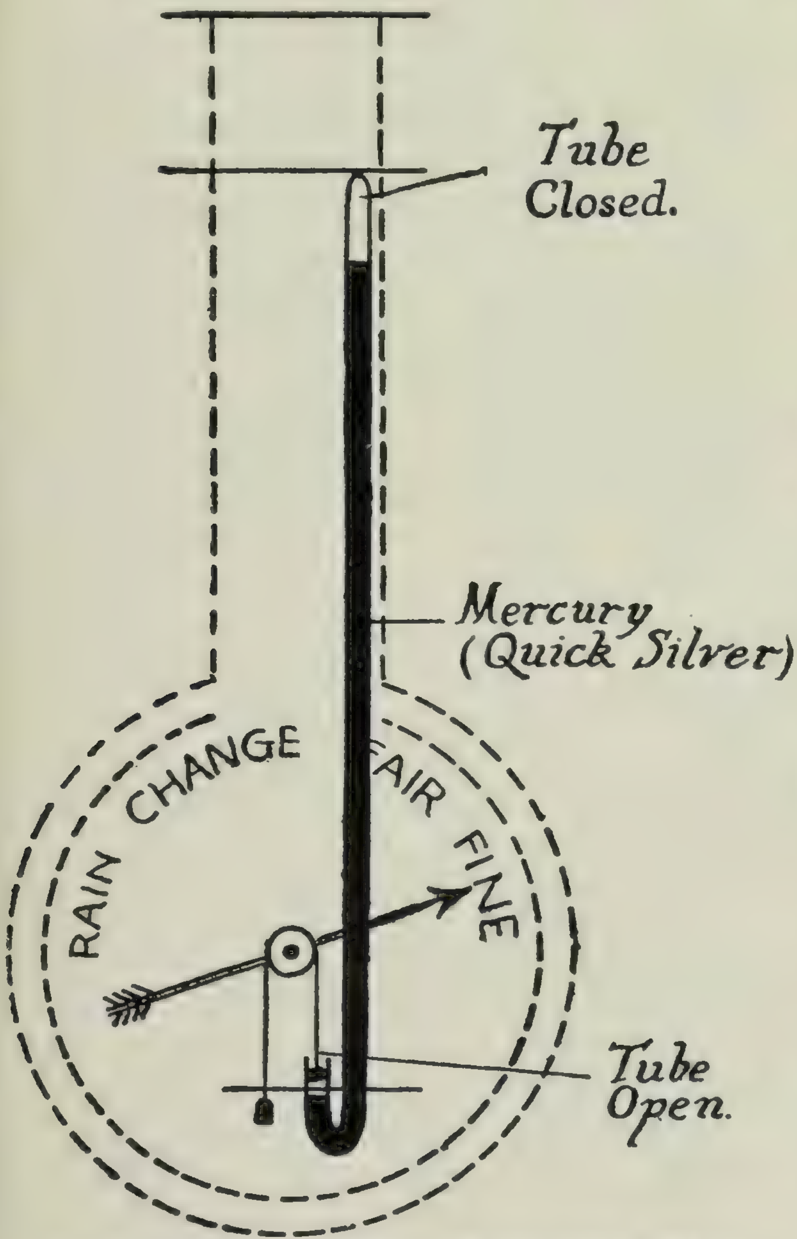
At the mercy of an icy monarch! When Scandinavia holds Britain in his icy grip, our bleak winter begins, and the sun goes on holiday.

saying, "It is not a *weather*-glass at all!" But we cannot fully understand what the barometer is actually telling the weather experts and ourselves, unless we know something more about it.

The word "barometer" means "weight measurer" (*Greek* baros = weight). The instrument tells us the weight, or pressure, of the atmosphere or air about us.

When we wish to weigh anything, we get a pair of scales and place the article to be weighed in one pan and the weights in the other. Looking at a simple barometer, however, such as is shown on this page, you can see that it consists of a long tube closed at one end and nearly full of mercury (quicksilver).

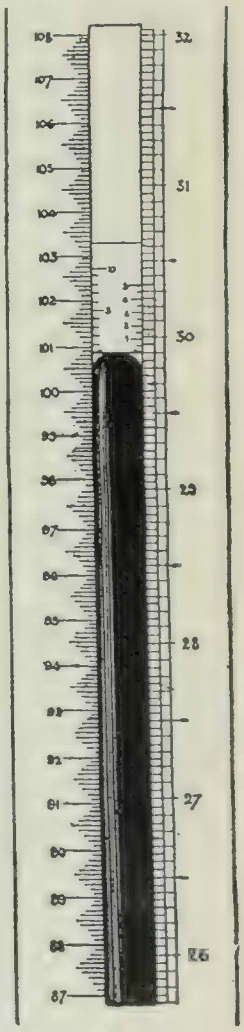
The column of mercury takes the place of weights on the scales and is used for weighing the air. Here we have mercury balancing air, just as the metal weights balance sugar at the grocer's.



The column of mercury in the barometer rises or falls as weather conditions change. When pressure is low, the mercury falls.

When the air is heavy, or the pressure high, as the experts say, the mercury rises in the tube till it is thirty inches high, or more. When the air is light, or the pressure low, the mercury column falls until its length is perhaps only twenty-eight inches.

HOW THE AIR IS WEIGHED, SO THAT THE WEATHER CAN BE GAUGED.



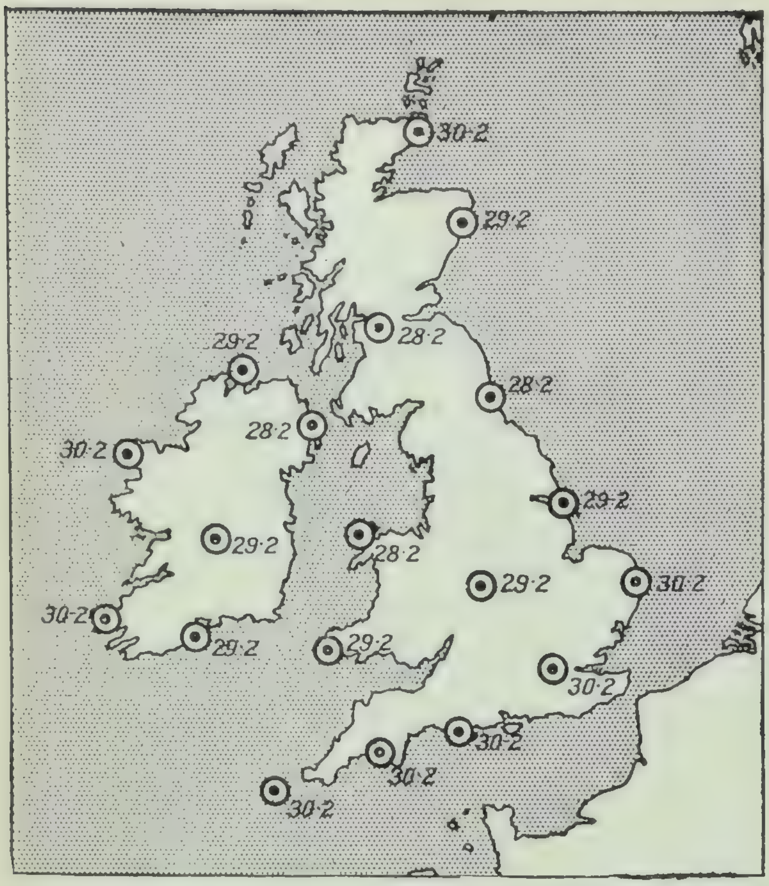
Barometer marked in millibars and inches. [*Courtesy H. M. Stationery Office.*

We could describe the weight of the air in pounds and ounces, just as we describe the weight of any article. But it is much more easy to explain the weight of the air, or the pressure of the atmosphere, in inches of the mercury column of the barometer.

Thus the weather experts at some or all of these forty-six stations note the weight of the air at certain times throughout the day and write these weights down in inches.[1] These notes are made at fixed hours during the day and are immediately sent by telegraph to headquarters from these stations.

Many other notes are made concerning weather conditions at the same time and sent along with the pressure measurement. But we will notice one other only, the direction of the wind. Although the weather expert discovers this by means of a

[1] (On the maps in these pages the inches are shown as millibars. 1000 millibars = 29·53 inches.)



The circles on the map show the positions of the weather stations. The figures show the barometer reading in inches.

complicated instrument, you could do this for yourselves, by looking at the weather-cock on the neighbouring church steeple.

At headquarters the readings sent in are recorded on a map such as you see above. To understand what information can be obtained from this map, let us suppose that three different pressures have been recorded as shown, namely 28.2 ins., 29.2 ins. and 30.2 ins. Each circle and the number opposite marks the position of the weather expert who took the reading given.

At the very outset, you must understand that we are considering an imaginary map. Seldom, if ever, would so many stations send the same readings as in this case.

At first glance, we see very little in this collection of numbers dotted over the map. But looking a little closer, we see that the places which sent 28·2 ins. are grouped near the centre of the map. At headquarters this fact is noted immediately.

DO YOU KNOW HOW TO READ A WEATHER-MAP?

Lines are then drawn joining places together where the pressure would be 28 ins. These lines run near the weather stations. In the same way, lines joining places where the pressure would be 29 ins. and 30 ins. are drawn as on the second map.

Sometimes, in real maps when many different readings are given, the lines might actually pass through the stations.

The lines drawn are known as isobars and these give our imaginary weather map a definite shape. The readings showing the directions of the winds are then entered on the map as arrows flying in the same direction as the wind at each station.

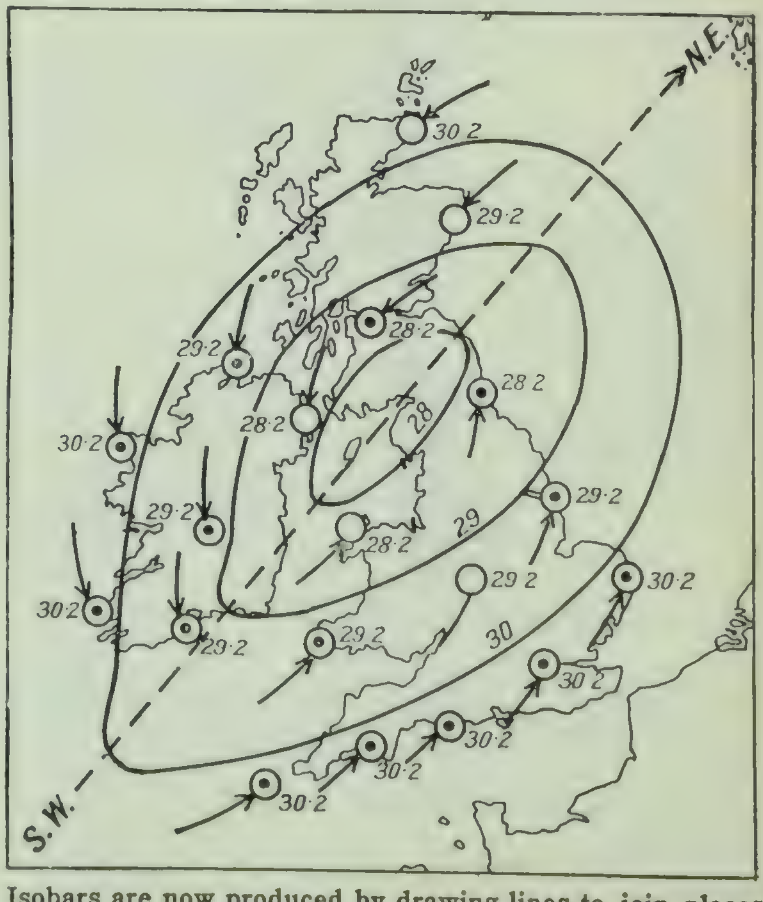
In real maps (p. 225) a number of feathers are attached to each wind arrow to show the strength of the wind. But we need not take this into consideration in this simple map.

We can easily see that the wind directions almost run in the same way as the isobars, but are turned in slightly towards the centre of the map. The wind is therefore moving towards the centre, and in a direction which is opposite to that in which the hands of a clock move.

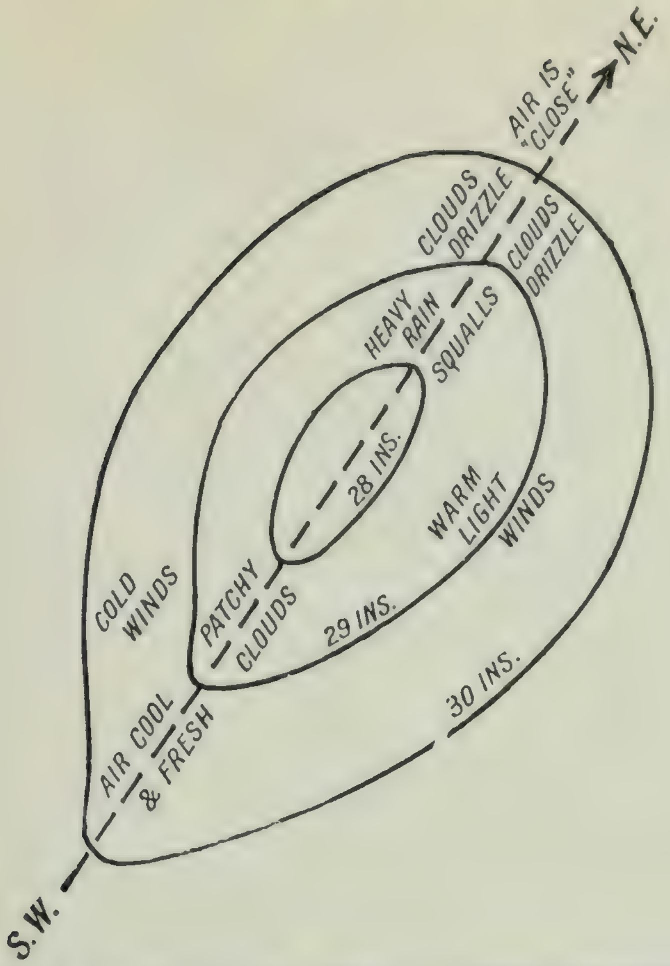
We have now noted the two most important points on our map, (a) the pressure of the air is lowest in the centre and (b) the winds are blowing towards the region of lowest pressure. These are the most important features of a storm bringing wet weather. The wireless announcers call this a depression. Your geography book calls it a cyclone.

HOW THE WEATHER-MAP SHOWS US THE DIRECTION A STORM IS TRAVELLING.

Now this storm usually affects an area about two hundred to three hundred miles across, and remember that it has travelled all the way across the Atlantic Ocean. Since it has reached



Isobars are now produced by drawing lines to join places of equal barometric pressure.



The storm depicted in this sketch is moving in a north-easterly direction.

our shores, we wish to know how it is going to affect us. It is to answer this question that such maps are drawn.

To return to our map. The direction in which the storm is travelling is shown by the line marked S.W. to N.E. If your home is anywhere along this line when the storm is approaching, the barometer will fall as the centre of the depression comes nearer and nearer. The wind will be from the south at first.

WHEN YOU FEEL RESTLESS, IS THE WEATHER TO BLAME?

Let us suppose that the pressure in the centre of the storm is very low. If you feel weather changes very much—and many people do—the approaching storm will have its effect on your feelings and actions. You may even have a headache.

Older people often complain of rheumatism at such a time, while others have asthma, or their corns may twinge more than usual. You who are at school also may become restless and not attend as well as usual, and even the animals and birds in field and farmyard are restive.

With the approach of the centre of the storm, the clouds thicken and rain begins to fall. The wind practically drops altogether. When the centre of the storm has passed the wind direction changes quickly so that it is blowing from the north-west, while the barometer begins to rise again. Soon the rain ceases, the clouds pass away, the sun comes out and blue sky appears.

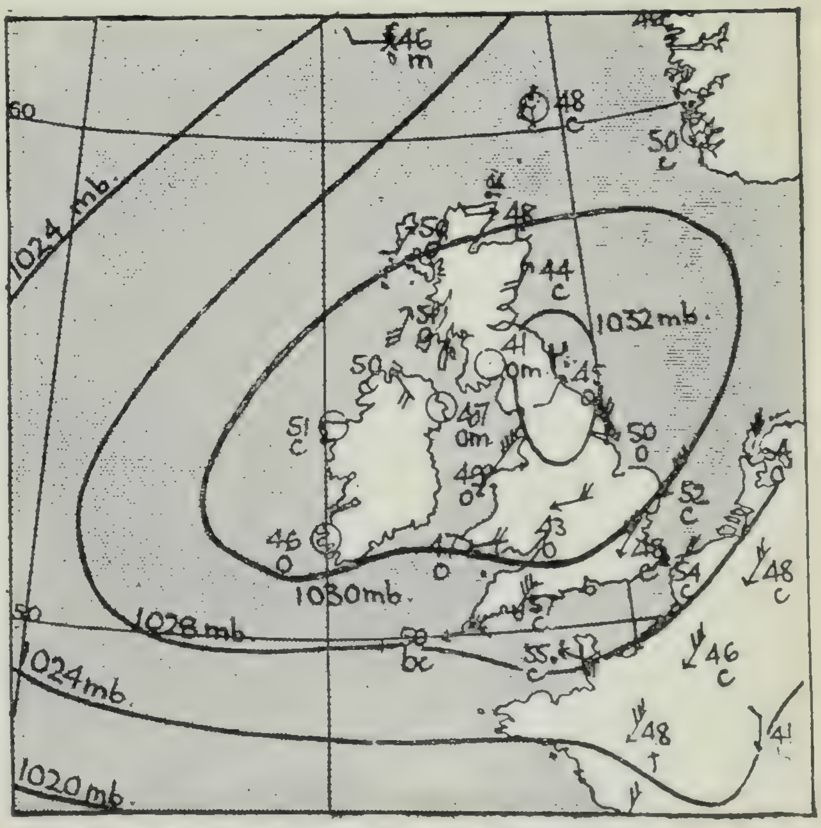
Your home, however, will not always be in the direct track of the centre of the storm, but it may be to the north or south. If to the north, rain will probably fall as in the former case, although not so heavily. But you will notice that the wind will change from south-east to easterly and then from north to north-west. On the other hand, if your home is to the south, the wind changes in the same direction as the sun travels.

DO YOU KNOW WHEN TO EXPECT FINE OR STORMY WEATHER?

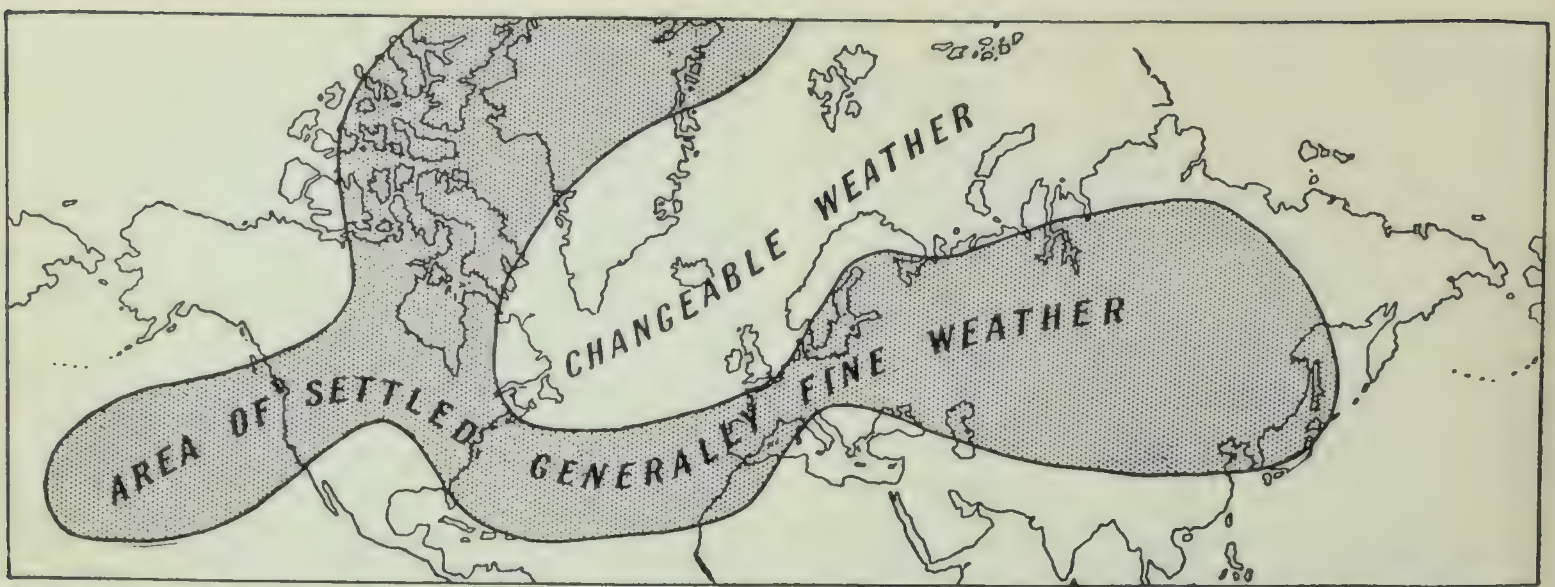
It follows then, that if we open our newspaper in the morning and see such a map, we can expect stormy weather. The storm may even have arrived before you see your newspaper. If not, you can follow it according to the position of your home on the map.

If we are especially anxious, we may even "listen-in" the night previously and hear whether the wireless announcer tells us about a depression. If he does, we know what to expect. Remember, he has been given the information as soon as, if not before, your newspaper was printed.

But the weather is not always bad! We have already seen that Greenland sends us "seasonable" weather in winter and that the east winds and the winds from the south Atlantic may bring us very warm days in summer. How are we to know when to expect *fine* weather?



This fine weather map shows an Anticyclone, or high pressure system.



In the northern hemisphere there is a large belt of land where there is usually settled weather. We are outside the belt.

Now let us suppose that the readings sent from the various stations are as given in the map at the foot of p. 255. This has been made in exactly the same way as those given previously.

It is noticeable at once that the arrangement of the pressure is quite different. The winds are blowing clockwise and blow outwards from the centre. Here we have a " high pressure system," as we hear over the wireless, or an " anticyclone," to use the words of our teacher.

Usually we find the weather fine under these conditions. The summer days are very warm —although the summer nights may be a little chilly—while in winter, we usually have frost.

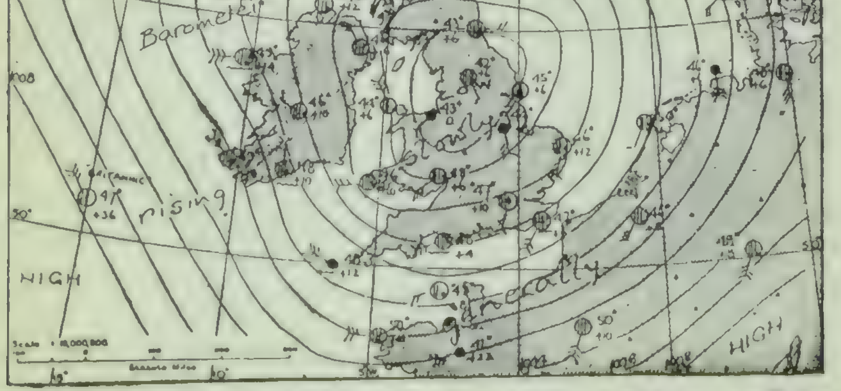
We have tried to explain that our depressions move eastwards—often at the rate of seven hundred miles per day. We must never forget this fact, as our whole knowledge of the weather that is to come depends upon it. But when we have fine weather from anticyclones, this usually remains the same for a few days, as high pressure systems often stay in the same place for some time.

But if we ourselves are wondering what the weather is going to be within the next hour or so, we usually look at the sky. Sometimes we see such weather signs there that we can tell just at once what kind of weather to expect—when we see the black shower clouds in the distance, for example.

Now most of us have wondered at some time or another how these clouds came to be there. We are now going to answer this question. In summer, we often ask our teacher for some fresh ink, as we find our inkwells almost empty. We say that the ink has dried up. In the same way, if we pour some water into a saucer and leave it for several days, we notice that the water has disappeared into the air. It seems, then, that the air can absorb, or suck up, water.

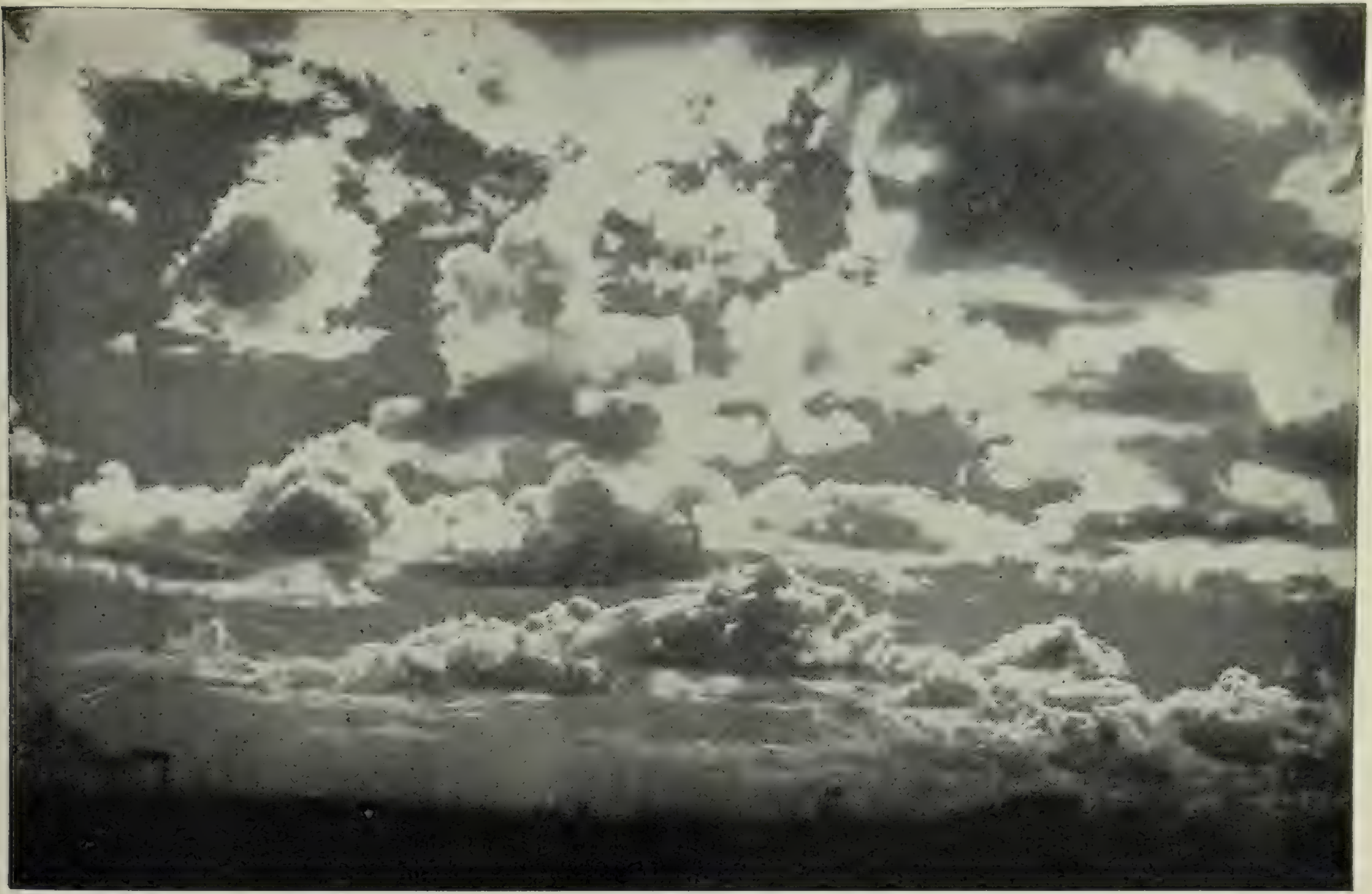
But we cannot see the water in the air, as it is present in the form of water-vapour, and when the water passes into the air, we say that evaporation has taken place. A certain amount of water vapour is present in the air all the time. If we bring a glass of cold water into a warm room, the glass becomes covered with moisture. Perhaps your room at home is not warm enough to bring this about. But if you put some ice into the water, you will soon see the moisture form.

Where does the moisture on the glass come from? It must have come from the air, for some of the water in the air has been condensed on the surface of the glass. But why has the water-vapour condensed? Because the air of the room was warmer

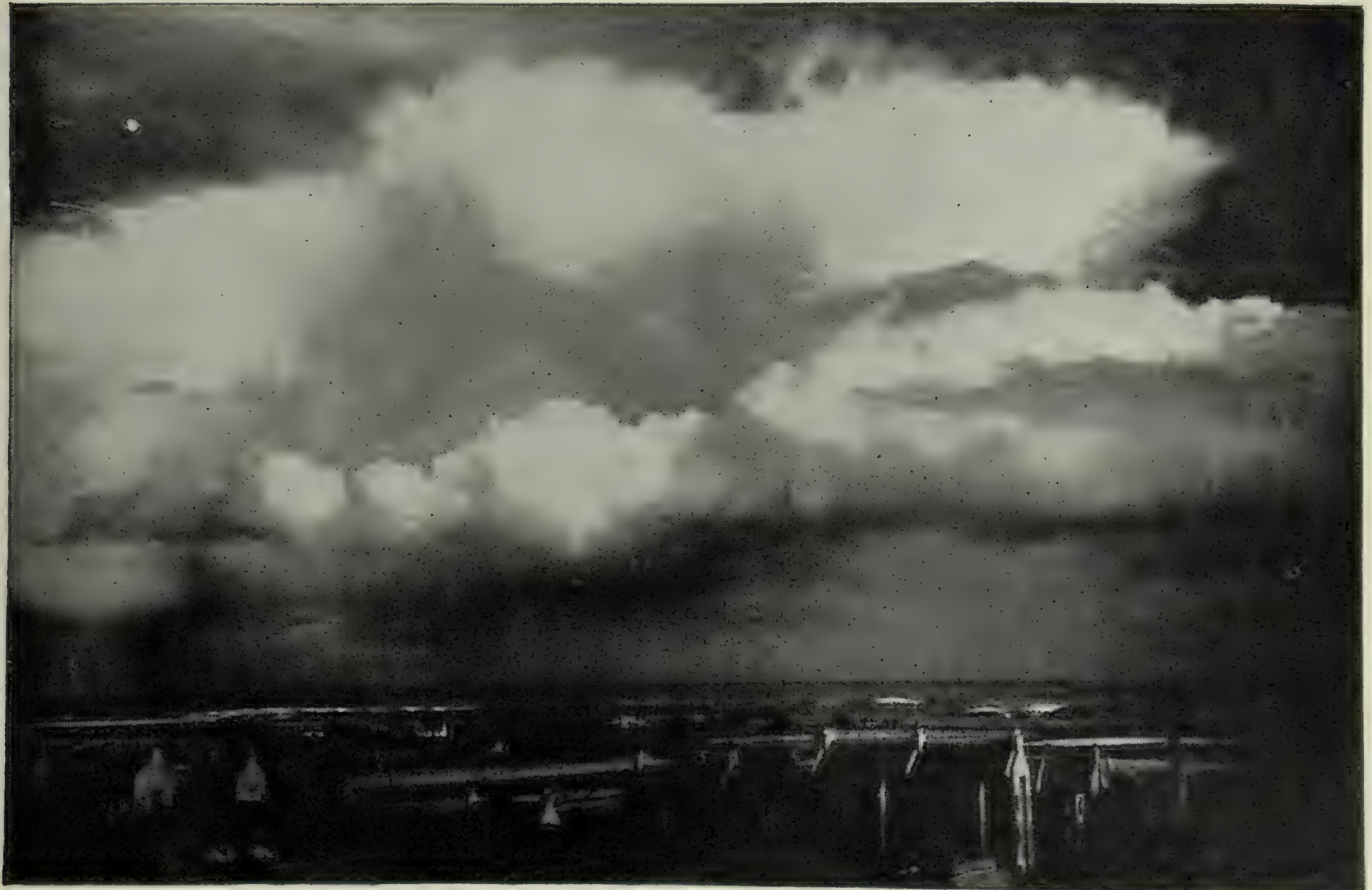


This wet weather map shows a depression, or cyclone. Note that the isobars are recorded in millibars. [*Courtesy H.M.S. Office*

HOW CLOUDS CAN FORETELL THE WEATHER



A magnificent study of feathery clouds in a summer sky. They are called "Woolpack" clouds or "Cumulus," because of their woolly appearance. Note the delicate silhouette of the city against this fleecy background of floating loveliness. [*Clarke.*

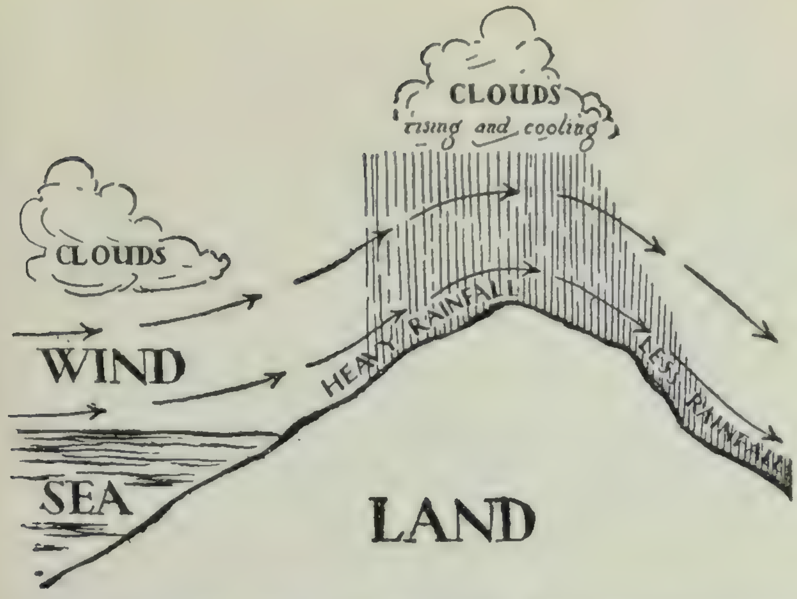


A study of thunder-clouds, or "Cumulo-nimbus," in a dark sky. We can see that a storm is about to break overhead. The heavy clouds roll downwards and are so realistic that we can almost hear the crash of the thunder. [*G. A. Clarke.*

WHEN FLEECY CLOUDS FLOAT OVERHEAD

Most of us are so busy watching the things around us that we often forget to notice the beauty of the clouds. The camera, however, has captured them for us, and shows a " mackerel sky," or "Alto Cumulus," in changeable weather.

When we see the " mare's tail," or " cirrus " in the sky we can look out for squalls, for a depression usually follows those feathery clouds. They are high in the sky, whereas some others—the nimbus, for example—are very low.



than the air near the cold surface of the glass. Thus we see that cold air cannot hold as much water-vapour as warm air, and that cold causes water-vapour to turn into water again. Also we see that, when cooled, the water-vapour can be seen as moisture.

Now when the winds are blowing over the ocean, as in our depressions when crossing the Atlantic, for example, they collect water-vapour. This water-vapour rises in the air, where it is condensed to form small specks of moisture which we see in *clouds*. Sometimes this moisture is so close to the ground that we have *fog*.

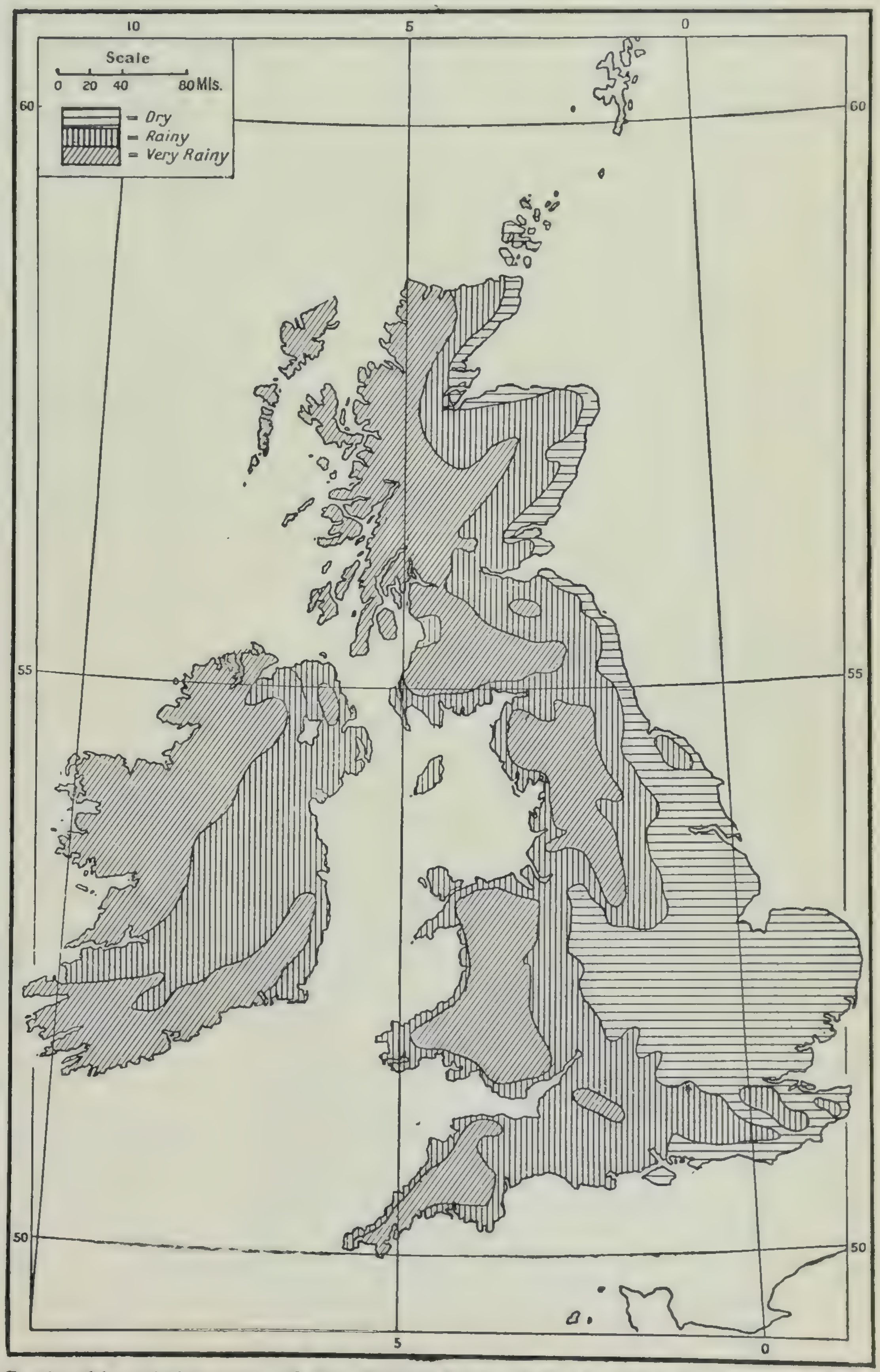
But there are different kinds of clouds and if we are to be able to tell what each kind of cloud means, we must know more about them. In this section we have some pictures of clouds which will help you to tell what kind of weather to expect when you see them.

The first is the Rain-Cloud. As you can see this looks very ugly and you can recognise it as the dark dreary sheet which covers the sky when we have stormy weather and steady rain.

The second is the calm weather cloud. Seldom do we have rain when we see these clouds, which often cover the whole sky with their waves, like a lifeless sea. When we have a winter anticyclone, and the weather is dull and grey, we often see such clouds.

WHAT ARE CLOUDS AND HOW DO THEY CHANGE TO DIFFERENT COLOURS?

The last picture shows the fine weather clouds which float high in the sky, so high indeed that sometimes this cloud is not made up of water vapour at all, but of beautiful little crystals of ice. White by day, these high fleecy clouds become most beautiful at sunset as they turn yellow and crimson in the western sky. Often in front of an approaching



Study this rainfall map of the British Isles. Why is it wettest in the west?

cyclone, these clouds give the sky a milky appearance and cause a halo round the sun and moon. Because of the dazzling light of the sun, we cannot see this halo. But we can often see such a halo round the moon on a moonlight night. This halo is a sure sign that a depression is approaching and we can expect stormy weather to follow.

WHAT ARE CLOUDS AND CAN YOU TELL WHY RAIN FALLS?

But you must remember that it is impossible for anyone to describe all the different kinds of clouds in the sky for you. Every time we look up, we realise that there is something different about the clouds from the last time we looked at them. You must therefore practise reading the cloud story of the sky for yourselves.

Now we have talked about storms and how we can forecast them, and we have seen that rain falls during these storms. But we have not explained *why* rain falls, and we are therefore going to see how this happens.

We noticed that clouds are made up of particles of moisture. These are always falling in the cloud in the same way as you may have noticed particles of chalk dust slowly falling downwards in a tumbler of water. When they reach the bottom of the cloud, these small particles of water-vapour form small drops of water. Soon these drops are united with other drops so large that they begin to fall through the air and reach the earth as rain.

HOW TINY FLOATING CRYSTALS OF ICE FALL TO EARTH AS SNOWFLAKES.

But although most of our rain-bearing storms pass right over the British Isles, all places in Britain do not have the same rainfall. Just look at the rainfall map on page 259 and you will realise that this is true. If you remember what a relief map of the British Isles is like, you will notice just at once that the mountainous districts have the most rain.

This is easily explained. When the clouds reach hilly country, they are forced to rise. Higher in the air it is colder. Now we have already noticed that when we brought a glass of water into a room the water-vapour condensed on the surface of the glass. The cold encouraged the water-vapour to turn into water again and this is just exactly what happens in the clouds above the high mountain tops.

In this way, the moisture-laden west winds blowing from the Atlantic cause heavy rain on the western sides of our mountains, while the districts east of the mountains are drier. East of the Central Highlands, for example, where Cairngorm, Ben Macdhui and Lochnagar rear their noble summits to the clouds, there is much less rain than to the west of the mountains. This explains why Ballater and Braemar, where the King usually spends the "Twelfth" of August, are such popular summer resorts.

Now we have seen that the fine weather clouds are often so high in the air that they are not made of particles of water-vapour but of very small crystals of ice. Sometimes it is so cold in winter, quite close to the ground, that such small crystals form in low clouds, then become interlocked to form snowflakes and finally fall as *snow*.

HOW MANY DIFFERENT KINDS OF ICE-CRYSTALS ARE THERE?

Hundreds of different kinds of ice crystals have been observed and it has been found that there are innumerable beautiful shapes sent down to earth when it snows. Some day you may have a chance of seeing some under a microscope and you will discover such wonderful designs for yourself. The strange thing is that although there are over a thousand different kinds of these crystals, each snow shower usually gives one kind of crystal design common to all snowflakes of that particular shower.

But not only do the ice crystals show beautiful designs ; so also do the snowflakes themselves. Next time snow is falling softly, go outside and allow a single flake to fall on your coat. You will be astonished when you examine it closely to see how perfectly it is designed. You will find that you have obtained a lovely little star with six arms, or rays, composed of little ice crystals.

We noticed that we had sometimes to add ice to our glass of water to make it cold enough to cause the condensation of the water-vapour in the room on the outside of the glass. Now, if we only placed ice alone in the glass, and especially if we added some salt, we would see frost form on the glass instead of water. Frost is formed when water-vapour is cooled below freezing point, or 32° F.

But these harmless particles of water-vapour in the clouds contain minute quantities of electricity. The world is full of this form of energy with which we are so familiar, and about which we know so little.

In Nature's mysterious way, as more and more particles of cloud-moisture unite to form

Snowed up! Sturdy engines pushing a snow-plough before them to clear the line which has been blocked by the storm. In severe snow-storms this plough is very useful.

rain drops, the cloud may become overcharged with electricity which seeks to escape to Mother Earth, its natural home. When this happens, the electrical current heats the particles of air in its track so that these become white hot and the electricity passes so quickly to the earth that sparking takes place. In other words, we have a flash of *lightning.*

But this heated air touched by the lightning expands very rapidly, and as soon as the flash has passed through it the air immediately contracts again. This rapid expansion and contraction of the air produces the noise known as the *thunder* of our thunderstorms.

HOW FAST DOES THE WIND BLOW DURING A WHIRLWIND?

Now, during a thunderstorm, sound travels about 1125 feet per second and it may be some little time after the thunder has taken place before you hear it. But you see the lightning immediately it flashes through the sky. You can therefore calculate how far the thunderstorm is away from you. For every second the sound takes to reach you after you have seen the lightning, allow a fifth of a mile and you will have a good idea as to how far away the storm is. Unless you live near the Atlantic Coast of the British Isles, you will have an opportunity of making this calculation some sultry summer afternoon.

While the Demons of the Upper Air fight out their battles, and thunderstorms rage around us, we earth-folk here in Britain cower for shelter. Nature in such a mood overawes us. But if we lived in many parts of the world—West Africa, for example—we would find the thunderstorm accompanied by a more dreadful enemy—the *tornado.*

This giant whirlwind, one to two hundred yards in diameter, is made up of violent inflowing currents of air—much more violent than those in a depression. In the Mississippi Valley, where it is called a cyclone, this raging terror tears across the country, travelling at a rate of thirty miles an hour. The winds that go to make it up may be blowing at two hundred miles per hour.

WHAT IS A WATERSPOUT, AND HOW IS IT CAUSED?

As the tornado sweeps across the country, it often leaves a clean-cut track of desolation in its path. Trees, buildings and crops are swept away and the toll of human lives is often very great. No wonder that the tornado is dreaded by the Americans! We in the British Isles have much to be thankful for in that we seldom have such whirlwinds and that they treat us much more kindly.

Still less need we fear the *waterspout* which takes place when a tornado is formed at sea. From the lower side of a storm cloud a point of cloud is seen to descend, and, at the same time, a swirling column of water is seen to rise from the sea.

The column of water so formed may be twenty to thirty feet thick and may be two hundred to three hundred feet high. This waterspout is truly a wonderful sight as it

In Norway, where the winters are very severe, snow ploughs like these are used to clear the railway line.

travels along the surface of the water. But if we saw one, perhaps we would be thankful that it lasted only a short time. They disappear into the ocean again after about ten minutes of weird but violent playfulness.

WHAT IS THE DIFFERENCE BETWEEN A TYPHOON AND A CYCLONE?

We should also be thankful that we know little about the *hurricane*, a name given to the violent wind storm of the West Indies. Almost equal to the tornado in its fury, the hurricane wreaks its vengeance not over a few hundred yards, but sometimes for hundreds of miles.

In the hurricane again, we find wind currents moving at eighty to a hundred and thirty miles an hour. These blow round and inwards and finally reach an area where an ominous calm exists. Needless to say, they cause terrible havoc, especially to ships at sea.

Nor are the activities of hurricanes confined to the West Indies. In the China Seas they are known as *typhoons*, and in the Indian Ocean as cyclones. But wherever they exist and whatever name they may be given, they represent Nature in her most terrible mood.

Yet we in Britain, who seldom, if ever, experience a gale blowing at a hundred miles an hour, often grumble about the weather. We should rather be grateful that we have no sudden great extremes of heat and cold, few hurricanes or disastrous blizzards.

WHERE DO THE ICY WINDS OF WINTER COME FROM?

Sometimes, however, the Russian bear stretches out his icy paw from his snowy land. But then those genial winds from the south-west and west soon thaw us and sometimes even make us think of the Isles of the Blest, where the sun will always shine and where winter's cold is not felt.

The wild winds of the storm are of service to us, for, let them once be taken away from us, and the cold of the icy north would enmantle us almost for ever.

The great peaks of the Himalayas in Northern India with snow on their mighty ridges. The country near the lower slopes is healthy and here white people retire during the hot season.

Some day you, like these happy children, will grow up and perform some work in the world. What will you do ?

FAMOUS MEN AND WOMEN

The tale of the world and its wonders is also the story of its men and women. So through the pages of this book you meet people who have performed great deeds, created beautiful things or brought new knowledge to mankind. The section that follows gives you, in very few words, some important facts concerning a number of people, both those whose names have lived through the ages and those who are still with us. A book many times the size of our own volume would be needed to tell, ever so briefly, of the lives of the most important people of past and present. Many of them indeed have had whole books written about them. Here a few have been chosen from the multitude, to help you to understand other parts of this book.

JOAN OF ARC was one of the most amazing personalities in the whole story of Europe. Spending her childhood as a humble peasant girl on her father's farm in Lorraine, she rose to be the deliverer of France and in 1920 was made a Saint.

As the seventeen-year-old Joan busied herself in the fields, she believed strange voices called to her to save France from the rule of the English. At first she was laughed at. But Joan's simple yet persistent personality had a knack of getting what it wanted. Clad in gorgeous white armour and riding on a magnificent white steed, she soon had permission to lead an armed force from Chinon. In a short time she drove the English from Orleans. Her confidence and simplicity of purpose put new courage into her countrymen, and in battle after battle the Maid of Orleans was victorious. In July, 1429, her great ambition was realised when the Dauphin was crowned Charles VII. in the stately Rheims Cathedral.

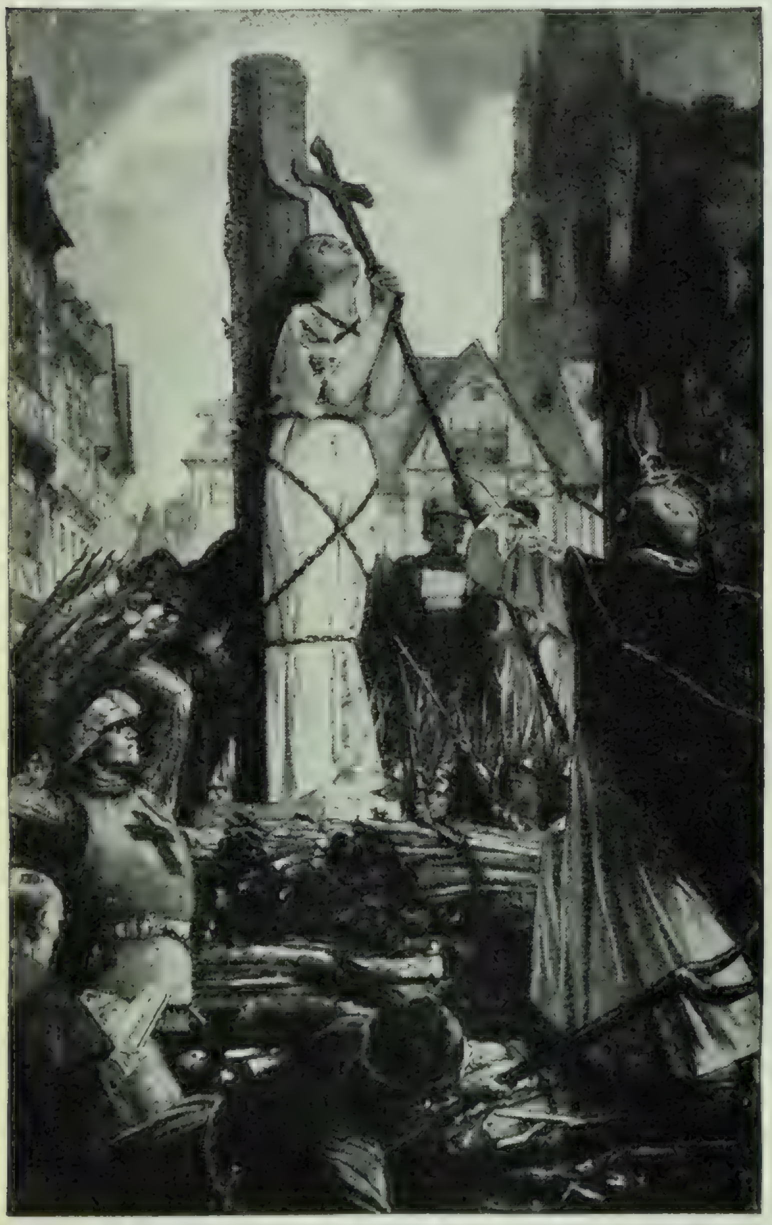
But her triumph was short-lived. The following year she fell into the hands of the English, when she was charged with witchcraft—a serious crime in those dark ages—found guilty and burned at the stake.

Joan's greatness could not die with her. Her astonishing life and spirit have inspired many writers, and probably the greatest piece of literature about her is George Bernard Shaw's wonderful play, *Saint Joan.* (Born 1412, died 1431.)

THE GIRL WHO LAUGHED IN THE FACE OF DANGER.

GRACE DARLING was a heroine of the early nineteenth century. Born at Longstone Lighthouse at the Farne Islands, she lived with her father, who was in charge there.

On the morning of September 7th, 1838, the *Forfarshire,* a 300-ton cargo boat, was dashed upon the rocks in the height of a raging storm. Even to the experienced lighthouse-keeper, Darling, rescue seemed impossible in the face of such torrential seas. But the great-hearted courage and heroism of young Grace laughed in the face of danger. Said she : " If no one will come with me I shall go alone." That was out of the question. With her father by her side, she perilously piloted a tiny boat through the mountainous seas to the vessel in distress, and brought many of the stranded people back to safety.



The brave maid of Orleans ends her stormy life amid burning flames and surrounded by English soldiery.

All Britain echoed her praise. But Grace Darling did not long enjoy her fame. At the age of twenty-seven she died from consumption. (Born 1815, died 1842.)

HOW A BOY, WHO WAS A DUNCE AT SCHOOL, ROSE TO FAME.

NAPOLEON was forty-second in his class at school. "But who," asks some one, "were the forty-one above him?" For, from the obscurity of a little Corsican town, Napoleon Bonaparte became the world's greatest adventurer and the most dazzling personage of nineteenth century history.

Educated at military schools in Brienne and Paris, he was put in charge of the French army in Italy in 1796, and found his popularity advancing with every spectacular victory. At the close of a brief campaign in Egypt, he returned to Paris, and was not long before he was able to declare himself first Consul of France. At the end of two years he changed his title to Consul for Life, and two years later still, named himself Emperor.

HOW NAPOLEON'S GREED FOR FAME CAUSED HIS DOWNFALL.

Shrewd enough to realise that battle had brought him fame, he decided to wage war against Europe. At first he met with almost miraculous success. At Jena and Austerlitz he vanquished the Prussians, at Eylau and Friedland he defeated Russia, and from Boulogne threatened England with invasion.

But his ambition was too greedy for any one man's ability. Fighting against enormous odds, his outposts began to crumble. His Spanish campaign was fruitless; at Moscow he had the biggest shock of his career; Britain's naval brilliance stood supreme. The end came with a decisive defeat at Leipsig and a determined invasion of France by the allies. In 1814 he had to surrender his position as Emperor and was exiled to Elba.

The drama was not yet over. Less than a year later he escaped back to Paris, rallied his troops together and met his enemies at Waterloo. This historic battle sealed his fate. Sent in captivity to St. Helena he lived only six years longer. (Born 1769, died 1821.)

HOW THE AMAZING ARMY OF "RED-SHIRTS" FOUGHT.

GUISEPPE GARIBALDI was the fisherman's son who rose to be one of the makers of modern Italy. A staunch champion of freedom even in his early youth, he became infected with the idea of joining the states of Italy into one great nation.

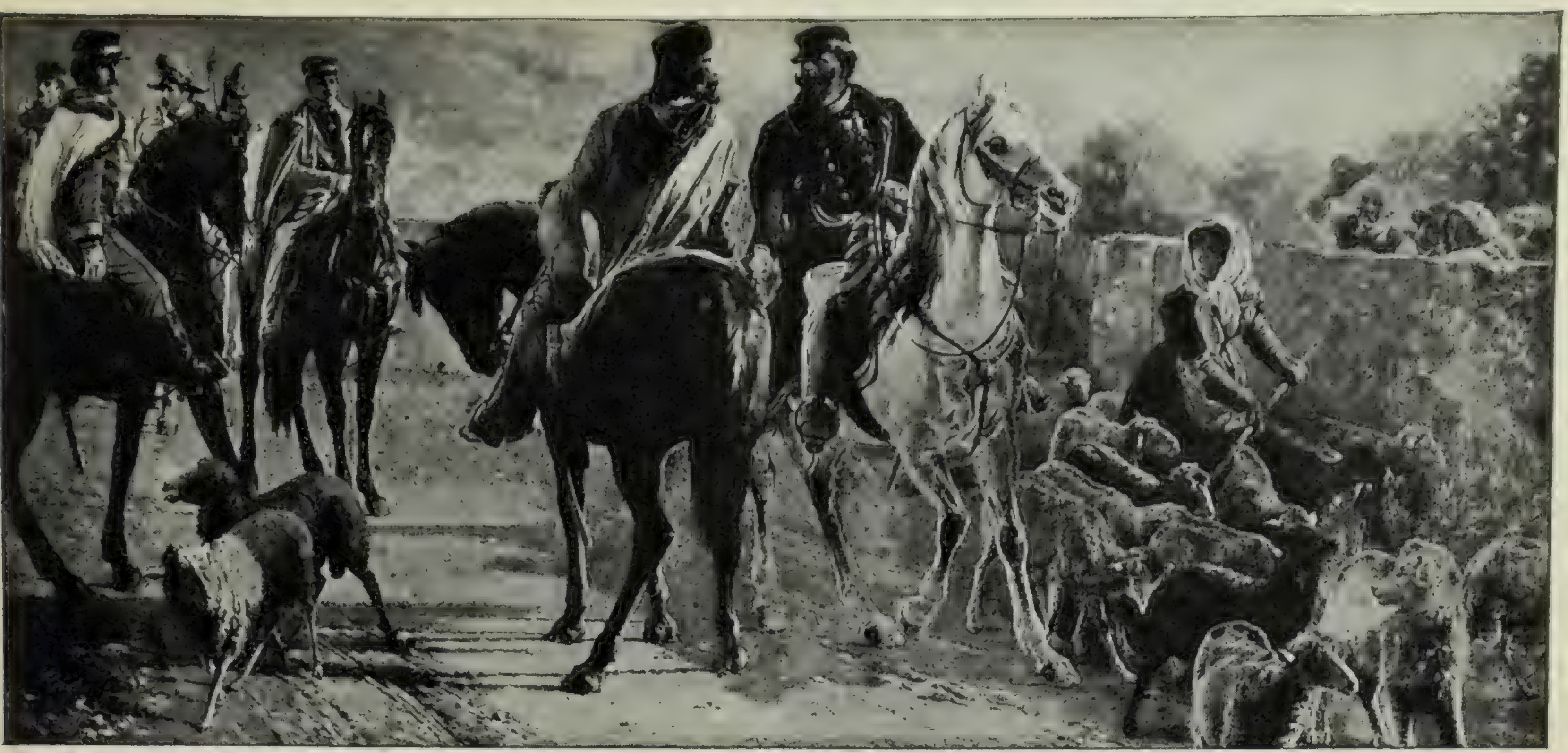
His adventurous and stormy spirit fired the imagination and confidence of the Italian patriots, with the result that his amazing army of "red-shirts" performed astonishing feats of "guerilla" warfare under the banner of a united Italy. He lived long enough to see the unification of the country he loved, with King Victor Emmanuel and his minister, Count Cavour, at its head. (Born 1807, died 1882.)

THE MAN WHOSE DYING REMARK MADE HIM FAMOUS.

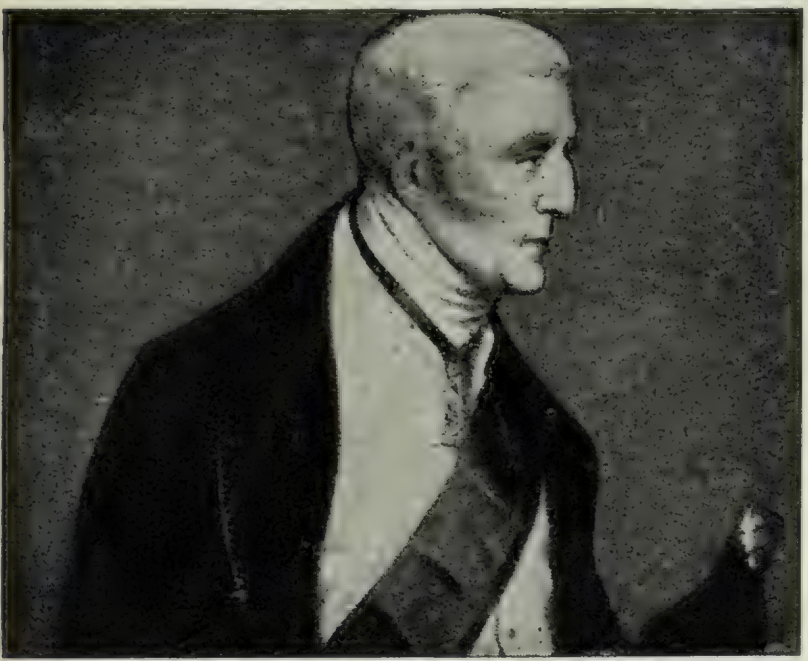
SIR PHILIP SIDNEY'S name has come down to posterity largely on the strength of an immortal remark made only a few moments before he died.

Always a gallant soldier, he was fighting for Queen Elizabeth's army in the Lowlands when

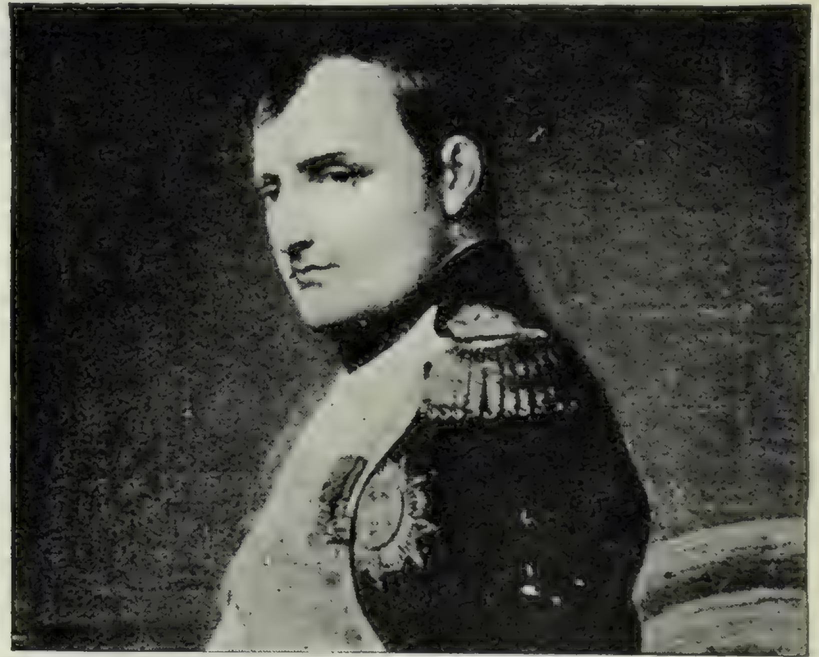
FAMOUS FIGURES IN EUROPEAN HISTORY



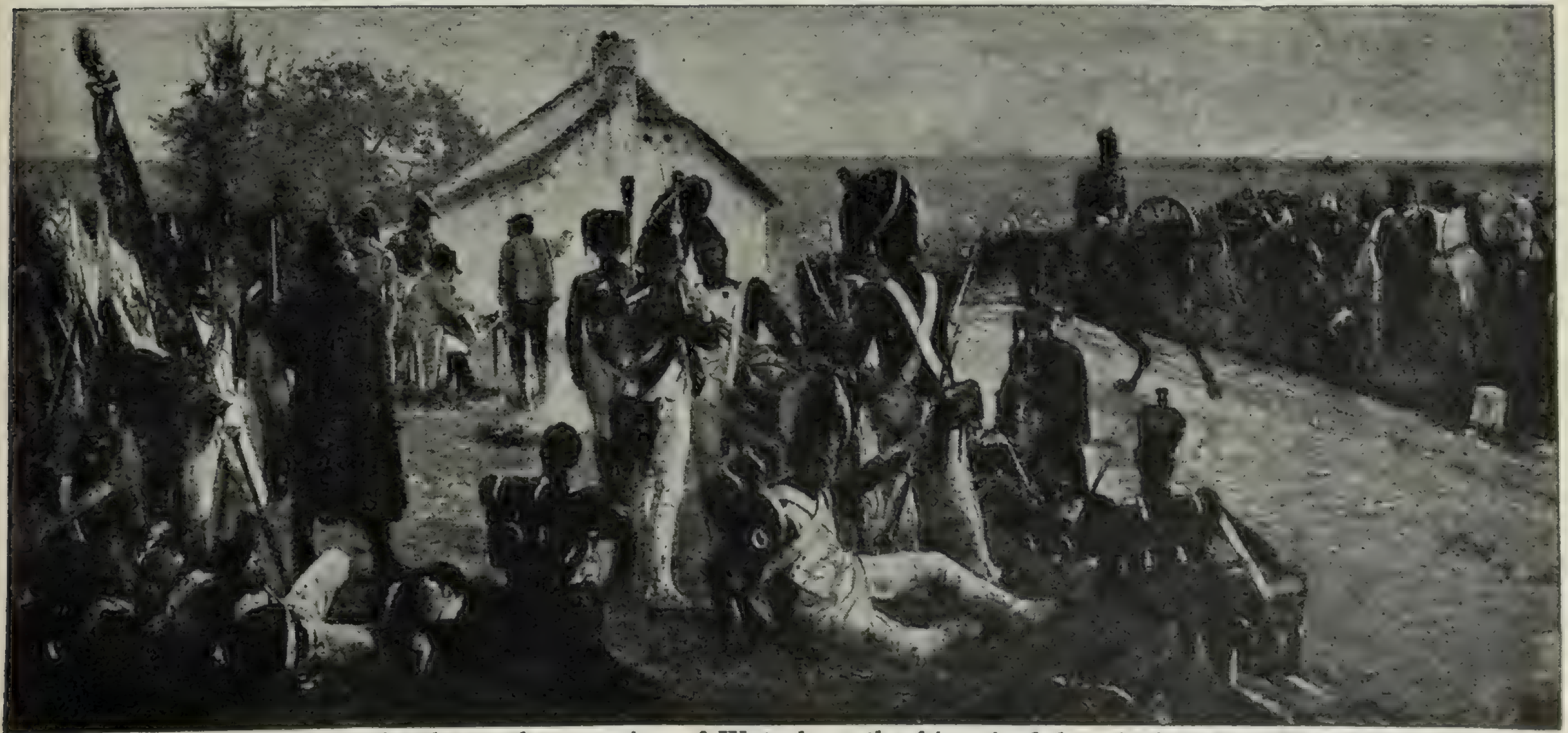
Garibaldi, the fisherman's son, who, with his "red-shirts," helped to unite Italy, meets King Victor Emmanuel II.



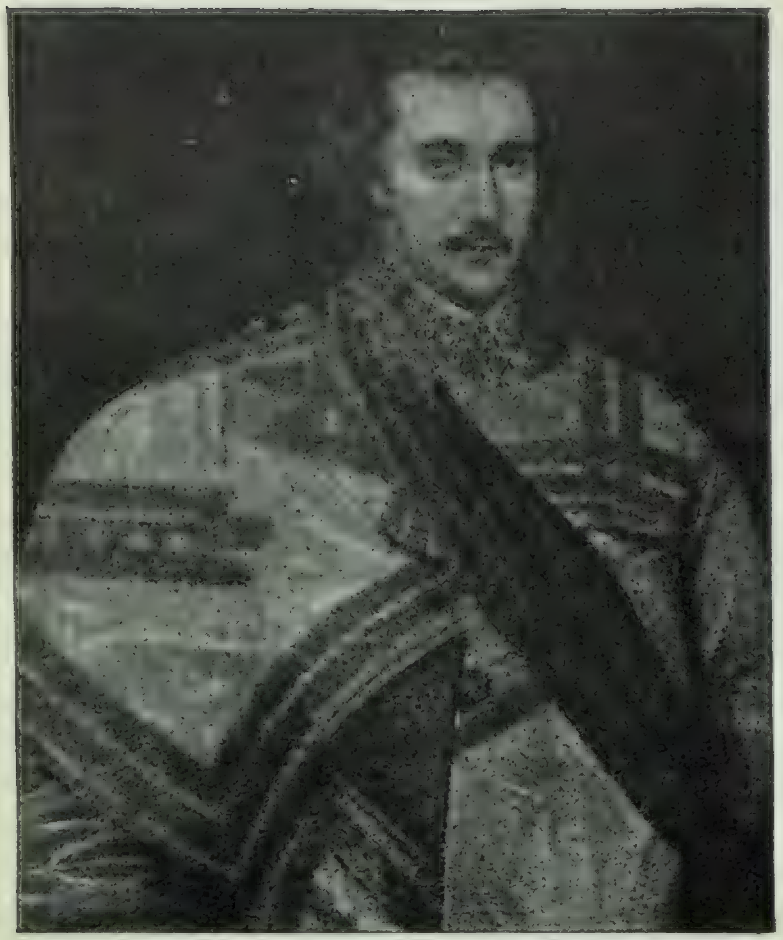
The Duke of Wellington, who earned the title of "Iron Duke."



Napoleon Bonaparte, whose ambition led to his downfall.



Troops on their way to battle on the morning of Waterloo—the historic fight which sealed Napoleon's fate.



The gallant Elizabethan soldier—Sir Philip Sidney—whose great courage, when he lay dying in agony, won admiration from everybody who heard his last brave words

he was mortally wounded. Carried to camp by his followers he lay in agony. Quietly he asked to moisten his lips with a drop of water.

Near by lay another wounded soldier parched with thirst. Sir Philip Sidney saw him and refused to drink the water. "Thy need is greater than mine," he said. That remark has come down the ages and still remains as an inspiring memorial to this cultured Elizabethan gentleman's supreme courage.

Besides being a soldier, Sir Philip was a talented poet, being a close friend of the great Spenser who wrote *The Faerie Queene*. (Born 1554, died 1586.)

THE IRON DUKE—A FIERCE FIGHTER WHO BECAME A PRIME MINISTER.

ARTHUR WELLESLEY, Duke of Wellington—often spoken of as the Iron Duke—was an almost perpetual thorn in the side of Napoleon. In the Spanish Peninsular Wars he won victory after victory against the French forces, and in the famous battle of Waterloo played a lion's part in the final overthrow of Napoleon's power.

The youngest son of the Earl of Mornington, Wellesley—like the heroic Nelson—was a delicate but courageous boy. At the age of nineteen he had become an ensign in the British Army and from that moment his promotion was rapid.

Long after his military retirement he took part in the government of Britain, being Prime Minister from 1828 to 1830. He is buried in St. Paul's Cathedral. (Born 1769, died 1852.)

HOW THE DASHING WARRIOR WHO FOUGHT AGAINST THE MOORS GOT NAMED "LE CID."

LE CID'S real name was Don Rodrigo Diaz, Count of Bivar, but his heroism against the Moors—then invading Spain—earned him the name of Cid, which is another word for Lord or Master. If you wish to learn the most picturesque story of this dashing warrior, who had driven the invaders from his native land before he had reached his twenty-first birthday, you should read the famous play by the distinguished French dramatist, Corneille. It is called *Le Cid*.

JOHN WESLEY—THE MAN WHO WOULD NOT BECOME RICH.

JOHN WESLEY, the great religious reformer and founder of the Methodist Church, was one of a clergyman's nineteen children. After being educated at Oxford, he mounted a horse and is said to have travelled five thousand miles a year—an immense distance then—preaching Methodism to the humble classes.

He deliberately avoided the rich, always organising great societies of worshippers and outlining his message to them in the fields, the street corners, or any place where he could gather an audience. He lived very sparingly, giving away all but £28 of his annual income.

Though often roughly handled by uncultured people, Wesley's determination enabled him to surmount obstacles of this kind. With his brother Charles—famed as a hymn writer—and two other men, James Hervey and George Whitefield, he laid the foundations of one of the largest religious organisations in the world. (Born 1703, died 1791.)

JOHN KNOX, THE STERN PROTESTANT, WHO SERVED AS A GALLEY-SLAVE IN HIS YOUTH.

JOHN KNOX, a statesman, a religious reformer and a writer, was the leader of the Reformation in Scotland. Originally a Roman priest, he learnt Luther's teachings from George Wishart, a Protestant martyr whose death at the stake aroused Knox's indignation. His powerful preaching earned him the post of pastor to the Protestant Scots, who rebelled and were besieged at St. Andrews. At the battle—in which Queen Mary was assisted by the French—Knox, then twenty-four, was captured and taken prisoner to France where he served on the galleys. On his release he returned to England, again had to flee to the Continent and finally settled in Scotland, where his doctrine of stern Protestantism obtained a strong influence over the people. (Born about 1505, died 1572.)

WHY WAS CONFUCIUS CALLED THE WISE MAN OF THE EAST?

CONFUCIUS was the Wise Man of the East. Born into a poor family, he studied hard when young, and at twenty-two established a school on the novel principle of only keeping scholars who showed brilliance, but never refusing a pupil because he could not pay the fees. As he grew older his fame for wisdom spread and he attained an enormous following. Unfortunately, like most great men, he had his enemies, and jealousy on the part of a ruler made the last part of his life a torment.

The famous golden rule, " What you do not like when done to yourself, do not do to others," is attributed to Confucius. (Born 550 B.C., died 478 B.C..)

THE MAN WHOSE NAME NOW LIVES IN A RELIGIOUS SECT.

JOHN CALVIN founded a religious body which, to-day, includes the Presbyterians, Independents, certain Baptists and most French Protestants. Then they were called Calvinists after their founder. His rich parents sent him to an expensive school where his interest in religion was first aroused. Along with Farel, another reformer, Calvin had a hard time with his new Protestantism but eventually he was recalled to Geneva where his principles were adopted. (Born 1509, died 1564).

HOW A HUMBLE CAMEL-DRIVER WROTE THE EASTERN BIBLE.

MOHAMMED was the simple camel-driver whose faith swayed the hearts of millions of Eastern people, and at one time threatened to capture Europe too. Sent from his guardian-uncle at twenty-five, Mohammed entered the service of a widow in Mecca whom he soon married. Always a profound thinker, he began to have dreams of how idolatry could be defeated and mankind brought to worship the one true God. Said to be inspired by the angel Gabriel, he wrote the Koran, the Bible of Mohammedanism, which all children of the faith have to learn. Persecuted at Mecca, he had to retire to Medina, where his followers rapidly grew in numbers. After a while he recaptured Mecca and his teaching, largely preached with the sword, spread like wildfire. (Born 570, died 632.)

ST. FRANCIS of Assisi spent his youth in riotous living, which eventually resulted in a serious illness that nearly proved fatal. Upon his recovery, however, Francis resolved to live a more exemplary life. Surrendering his wealth, he dressed in coarse clothes, wandering barefoot and bare-headed, helping the needy. The people who chose to follow his example formed themselves into a body of monks named the Franciscans, perhaps better known as the Grey Friars on account of their clothes. (Born 1182, died 1226.)

HOW THE QUAKERS OR SOCIETY OF FRIENDS BEGAN.

GEORGE FOX, one of the most sincere men who ever lived, was the founder of the Quakers or Society of Friends. The son of a Puritan weaver, Fox early revealed his marked ability for preaching that reached the hearts of his listeners. " Quakers " is really a nick-

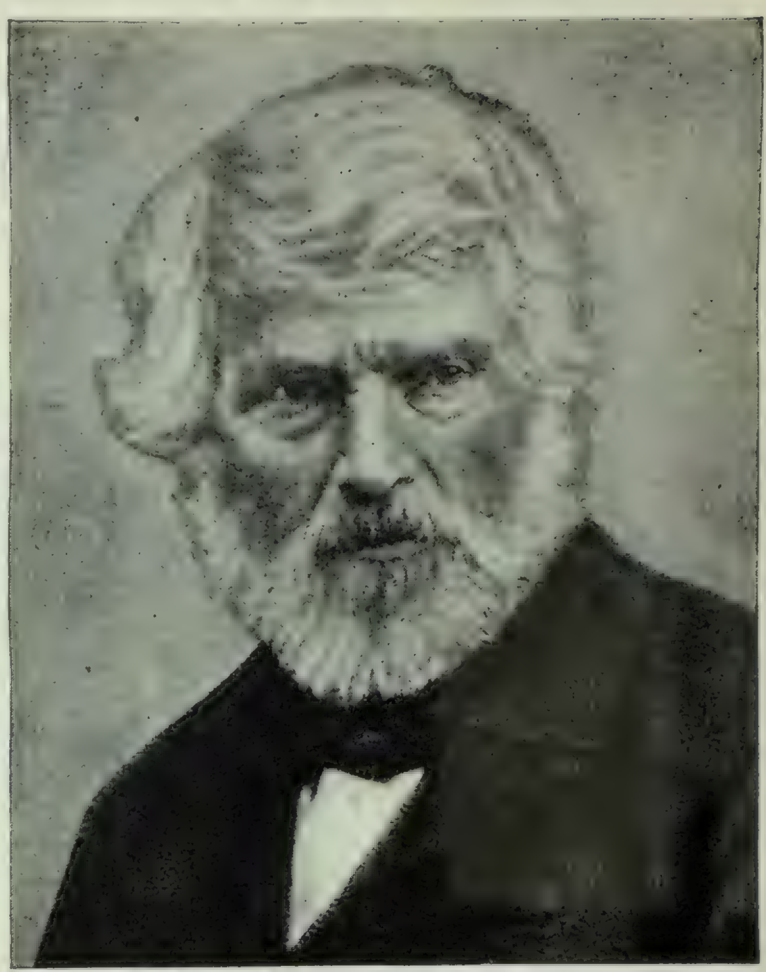
St. Francis is remembered by his saintly life and his kindness to animals. He also helped the poor and needy. The sheep seems to listen trustfully as he speaks.

name earned by the Friends at Derby, where Fox bade the magistrates "tremble at the name of the Lord." (Born 1624, died 1691.)

THE RICH MAN WHO BECAME A BEGGAR AND FOUNDED A STRANGE RELIGION.

BUDDHA'S real name was Gautama. He was the son of an Indian rajah, and the founder of a strange religion which is said to embrace more than five hundred million people. Buddha's philosophy was the opposite of "Looking on the Bright Side of Life." Suddenly leaving his life of luxurious but thoughtful seclusion, he was overcome with the horrors and ugliness of the world. He renounced his riches, and as a lowly beggar went in search of the secret of life. We learn how, one day, enlightenment came to him while sitting under a tree. Since then the Buddhists have always regarded that sacred spot as the centre of earth. (Born 483 B.C., died 403 B.C.)

A beautifully carved statue of Buddha, the son of an Indian Rajah. Note the intricate workmanship on the throne.



Thomas Carlyle, who struggled against many difficulties and refused to be daunted. He found fame as a man of letters even though his famous work was destroyed by fire.

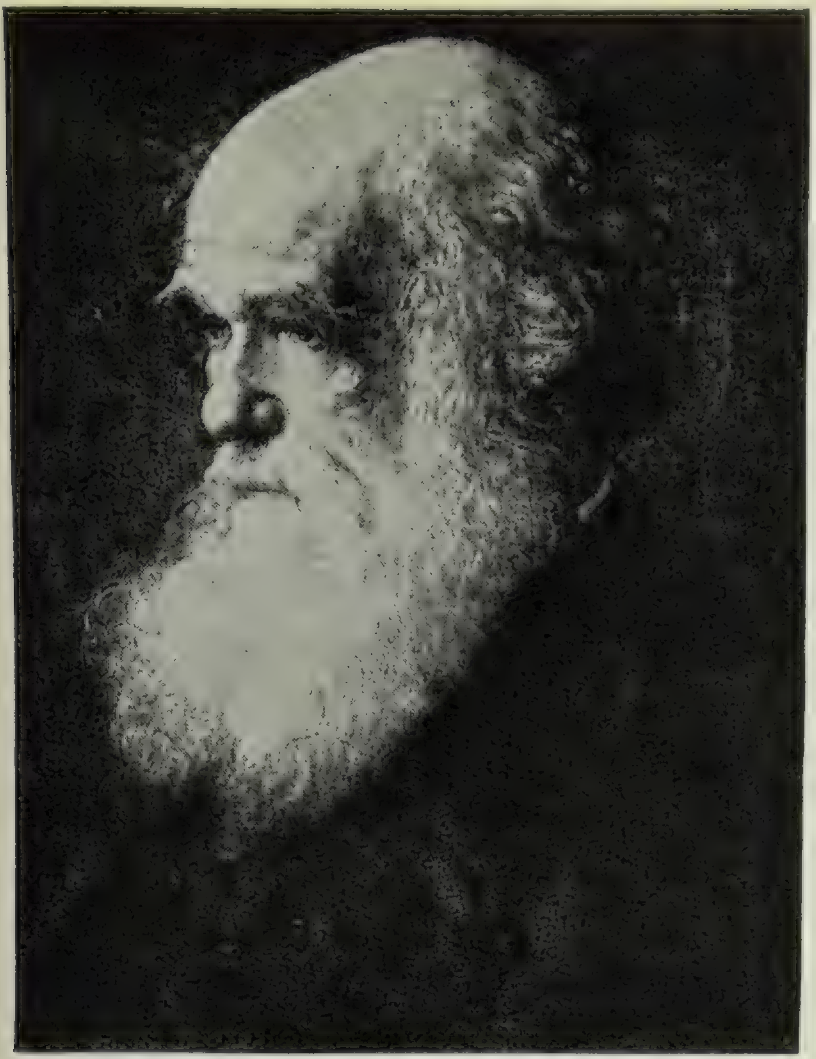
THE NOBLE THINKER WHO WROTE A BOOK TWICE OVER.

THOMAS CARLYLE, a Scottish essayist and historian, was one of the most powerful thinkers of his day. The son of a poor stonemason and small farmer, young Carlyle had to fight his own way in the world. He was helped in his struggle by Jane Welsh, his talented and devoted wife, whose sudden death was a great blow to Carlyle.

Some idea of his patience, determination and capacity for work is gained by the true story of how a maidservant destroyed by accident the whole manuscript of his enormous *History of the French Revolution.* Though her action sent years of hard toil up the chimney in smoke, Carlyle did not cry over spilt milk. He rewrote the entire work, and now it ranks among his most important publications. (Born 1795, died 1881.)

THE HANDSOME GREEK POET WHO WROTE OVER A HUNDRED PLAYS.

SOPHOCLES, the great Greek poet, was born near Athens. The fine polish of his language was reflected in his charming manner and beauty of person. Of the hundred plays



Charles Darwin, the man who was destined for the church, but who ended as a famous scientific figure.

he wrote, only seven are known. Besides being a wonderful dramatist Sophocles was also a soldier who rose to the rank of general. (Born 495 B.C., died 406 B.C.)

THE MAN WHO PUZZLED OVER THE LAWS OF NATURE.

CHARLES ROBERT DARWIN gave little indication in his boyhood that some day he would be the most-discussed scientific figure of the nineteenth century.

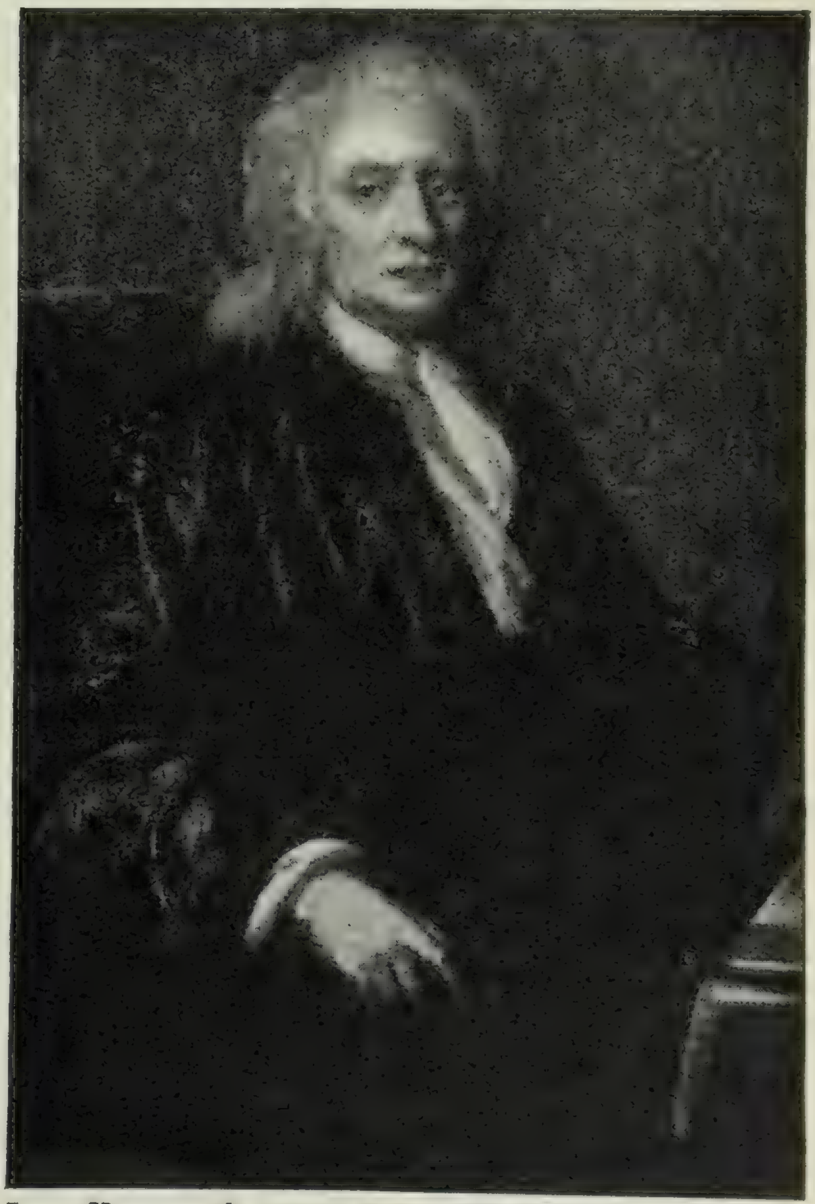
Originally destined for the Church, the turning point of his career came in 1831 when he joined the *Beagle* on its detailed survey of the Atlantic and Pacific Oceans. The knowledge he there gained formed the backbone of his future researches. For the next twenty-three years he devoted himself to scientific investigations, the results of which were published in the famous *Origin of Species.* This book expresses the belief that the relentless law of Nature is the survival of the fittest. In other words, there is a perpetual tussle for existence among all animals, and thus, through the ages, animals only retain those qualities best suited to their needs. You often hear people say that Darwin invented the theory of evolution (the beginning, growth and development of living things). That is wrong. He merely offered a very clever explanation of how evolution had come about. (Born 1809, died 1882.)

HOW A DUNCE CAME TO BE A GREAT THINKER AND A FAMOUS MAN.

SIR ISAAC NEWTON'S life reveals how little incidents may often have important results. At school he was looked upon as a dunce. But one day he fought and beat another boy, and this victory strangely inspired him to work until he was at the top of the class.

On another occasion—while sleeping under a tree in an orchard—an apple fell on him. Most people would have thought nothing further about it. But Newton was puzzled, and from his perplexity came the recognition of the important law of gravity.

His experiments with lenses and sunlight enabled him to discover how we get different colours, and how light is really made up of the various tints of the rainbow. Though his book, *Principia,* earned him admiration from all over Europe, Newton was never spoiled by fame, and regarded his discoveries as very small compared with the other, unsolved mysteries of the universe. (Born 1642, died 1727.)



Isaac Newton, the man who went about observing everything and using his brains to solve the mysteries of the world. The law of gravity was his particular study.

THE FAMOUS STATESMAN WHO MADE SOAP AND CANDLES IN HIS YOUTH.

Benjamin Franklin, who gained fame in many ways, was an inventor, a writer, a statesman, a newspaper publisher, a business man, an ambassador, and one of the most beloved personalities of the eighteenth century.

His most famous exploit was his spectacular discovery that lightning and electricity were really the same. When he first told the Royal Society that his specially constructed kite had snatched the lightning from the clouds he was laughed at. But later the members had to confess it was they who were wrong. And behind that kite experiment lies the invention of the modern lightning conductor. Franklin also had a share in drawing up the Declaration of Independence by which the United States of America became a separate nation, independent of the British Empire. He was an American ambassador to France, and printed the *Saturday Evening Post.* Considering that his childhood was spent helping his father in the uninspiring job of soap-boiling and candle-making, history shows few finer examples of a self-educated man achieving fame. (Born 1706, died 1790.)

THE MAN WHO FOUND OUT THAT THE EARTH WAS ROUND.

Nicholas Copernicus, the Polish astronomer, completely upset Man's ideas of the world. His parents were only poor, but his cleverness at mathematics and in scientific subjects enabled him to secure his degree as a doctor of medicine and obtain a responsible teaching post at Rome and Bologna.

Meanwhile, he was busy making astronomical observations and gathering information about the earth, the sun and the stars. His discoveries actually frightened him. For he found that—contrary to all beliefs at the time—the earth was really round and revolving on an axis, instead of flat as every one imagined. For thirteen years he refrained from telling people his news, which soon proved to be the root of all astronomical research. (Born 1473, died 1543.)

HOW A MAN SET FIRE TO THE ROMAN FLEET BY AN ARRANGEMENT OF MIRRORS.

Archimedes is the most renowned of Greek mathematicians, chiefly on account of his famous Principle which says that the weight of a floating body is equal to the weight of the fluid it displaces. It is said that the famous thinker was taking his bath when he discovered this Principle, and that he jumped up, and ran out into the street, shouting, "Eureka"—which means "I've got it."

He was born at Syracuse, and often his brains were harnessed for the welfare of his country. Once he set fire to the invading Roman fleet by arranging mirrors to reflect the sun's hot rays to one single point or focus.

He discovered the use of the lever, and is said to have invented the endless screw and the spiral pump. Archimedes met his death at the work he loved most, being killed by a Roman soldier while drawing a diagram in the sand. (Born 287 B.C., died 212 B.C.)

THE MAN WHO DISCOVERED THE AMAZING POWER OF ELECTRICITY.

Michael Faraday was apprenticed to a bookbinder, but his heart was always pledged to science. It is fortunate for man that the great Sir Humphry Davy encouraged the youthful scientist in his studies. Faraday's researches in electricity form the basis of countless modern electrical marvels. It was he who discovered that when a magnet is moved near a coil of wire a current of electricity flows through the coil. By means of a simple experiment he first proved that not only can a magnet be twisted by an electric wire, but an electric wire can be twisted by a magnet. And as he watched the movement of the magnet and the wire, he danced with joy round his apparatus, crying, "There they go, there they go!"

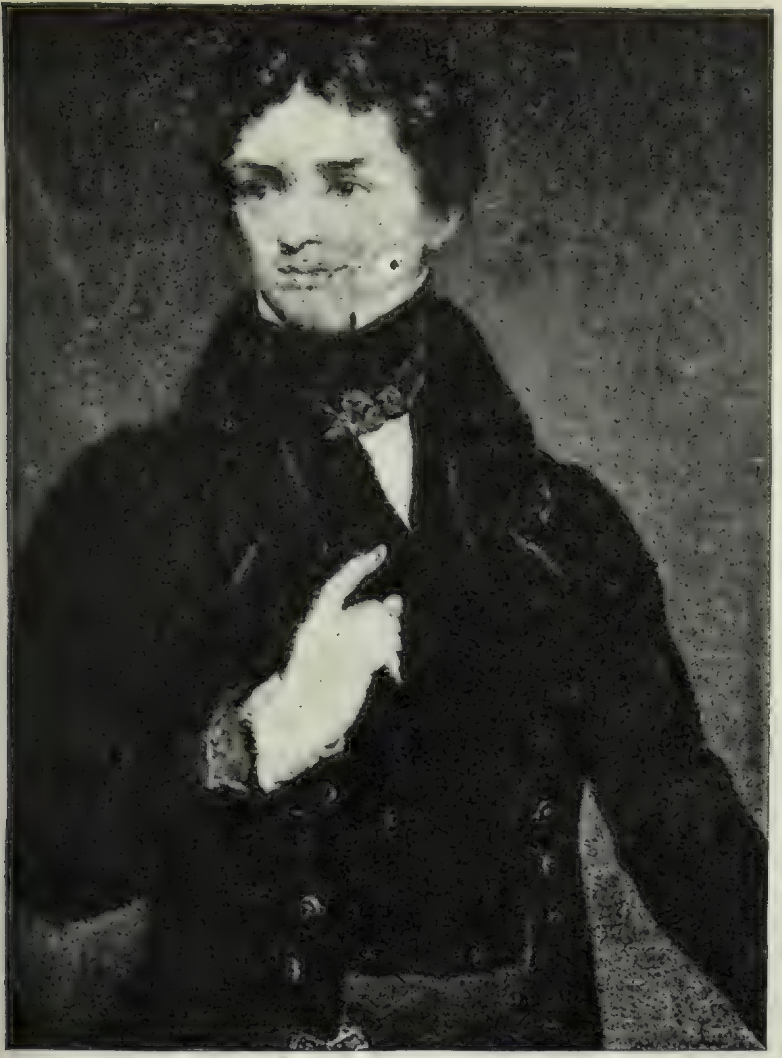
Without the knowledge resulting from this discovery all the wonders of present-day electrical power would be impossible—as would many other marvels which are still to come. Faraday himself believed that "every particle of matter is a centre of force reaching to an infinite distance, binding worlds and suns together," influencing all the phenomena of nature and even life itself.

Although he was such an enthusiastic scientist, Faraday was often quite unconcerned about things which other people thought very important. He was travelling on the Continent when Napoleon's escape from Elba shook the civilised world. "I heard the news," wrote Faraday, "that Buonaparte was again at liberty. Being no politician, I did not trouble myself much about it." (Born 1791, died 1867.)

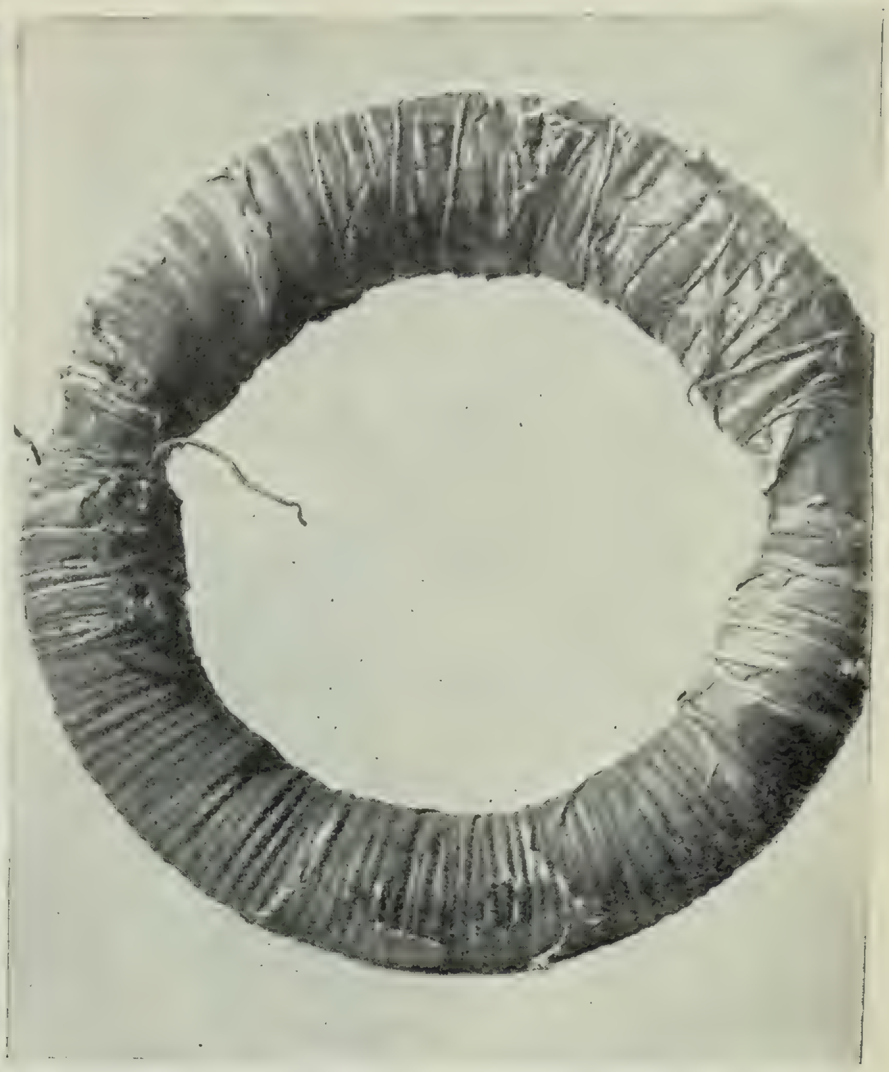
HOW A BOOKWORM WORKED HARD TO BECOME A BRILLIANT SCIENTIST.

Thomas Henry Huxley was a born bookworm. He more than compensated for his inadequate education by eagerly devouring book after book, often getting up in the

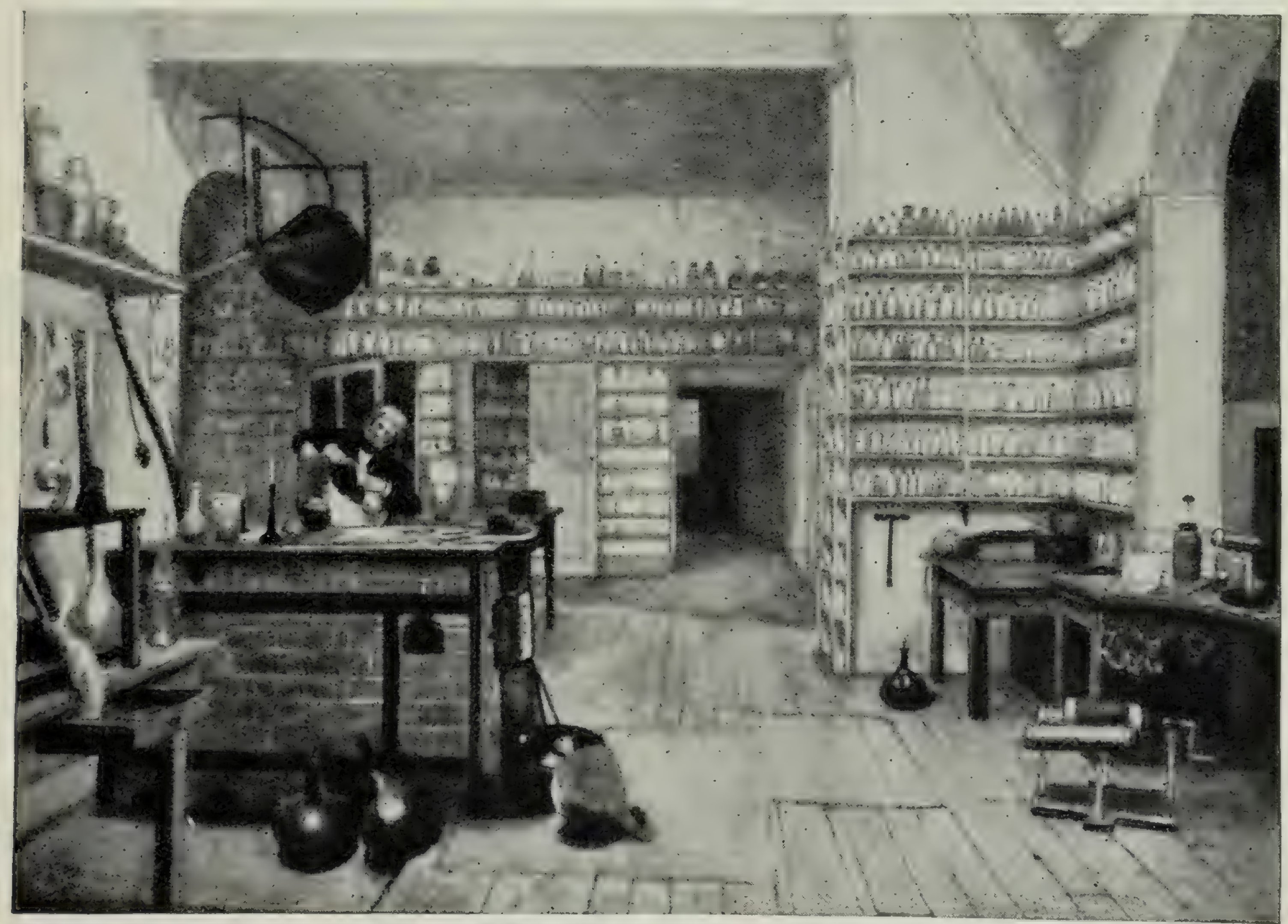
FARADAY, FATHER OF ELECTRICAL SCIENCE



A portrait of Michael Faraday, the great scientist, who died in 1867, and to whose inventive brain we owe the wonders of electric power.



In 1831, Faraday made an induction coil from which great developments were made. His researches form the basis of many modern marvels which we owe to his brain.



In his business-like laboratory we see Michael Faraday, the poor blacksmith's son who gave his heart to science, absorbed in his work. He is busy with the researches which have made his name famous. The Faraday Society was founded in his honour. [*Royal Institution.*

early hours of the morning to wrestle with some scientific masterpiece. His industry bore fruit. When only twenty-six, he was admitted a member of the Royal Society.

Huxley's work covered many spheres. He is chiefly known, however, as the brilliant interpreter of the theory of Evolution and the indomitable champion of Charles Darwin. (Born 1825, died 1895.)

THE MINISTER OF RELIGION WHO DISCOVERED OXYGEN.

JOSEPH PRIESTLEY, born at Birstall, near Leeds, was the discoverer of oxygen. Though educated for the Ministry, Priestley's fame rests on his scientific researches. Persecuted at Birmingham by his political opponents, he emigrated to Pennsylvania. (Born 1733, died 1804.)

THE POOR LABOURER WHO WAS MADE TO END HIS LIFE BY POISONING HIMSELF.

SOCRATES, like Jesus, left no great literary works behind him. Yet his views and philosophy have passed undimmed down the centuries and been a searchlight on the age in which he lived. Judged from wordly standards, Socrates was only a poor labourer and soldier. He wore the simplest clothing. He was noticeably ugly. But his thoughts were beautifully draped in words and lofty in their message. Ever wandering through the streets of Athens, he impressed upon his listeners the importance of really knowing themselves. Naturally he had enemies, for some were jealous of his widening influence with the young people. On a petty charge he was tried and condemned to poison himself. Even while the hemlock did its fatal work Socrates chatted cheerfully to his friends. (Born 470 B.C., died 399 B.C.)

THE FAMOUS SCIENTIST WHO HELPED TO PERFECT WIRELESS TELEPHONY.

SIR OLIVER LODGE, President of the British Association in 1913, is best known for his pioneer research in wireless and electricity, and his staunch belief in spiritualism. He was the first Principal of Birmingham University, and was knighted in 1902. (Born 1851.)

HOW A SWINGING LAMP LED TO THE MAKING OF THE FIRST SWINGING PENDULUM CLOCK.

GALILEO came into the world equipped with an inquiring mind and keen powers of observation. When only twenty-two, he was appointed Professor of Mathematics at Pisa University, and there much of his most memorable work was done. From the famous Leaning Tower of Pisa he dropped objects of different weights and discovered they reached the ground at the same time. From this simple experiment many of our complex laws of motion have been calculated.

Impressed by the regularity of movement of a swinging lamp in Pisa Cathedral, Galileo constructed the first swinging pendulum clock, the forerunner of all modern timepieces.

Perhaps the world of astronomy best respects Galileo. With a giant home-made telescope he explored the mysteries of the heavens. Like Copernicus, he believed the earth revolved round the sun. This opinion got him into serious trouble, because it was opposed to the age-old views of the Church. Tried by the Inquisition, he was compelled to deny the truth of his own discoveries. Though even further handicapped by blindness, he still continued to work in secret. Nowadays we know he was right and the Church wrong. (Born 1564, died 1642.)

THE MAN WHO MADE EVERYBODY BELIEVE THAT THE EARTH WAS THE CENTRE OF THE UNIVERSE.

PTOLEMY, the Egyptian astronomer, was responsible for a mistaken belief that was accepted for over 1300 years. He believed that the earth was the centre of the universe; that heavenly bodies revolved round it once in twenty-four hours; that the sky was an immense sphere turning on a huge axis with the stars fixed on the inner surface. (He lived in the second century B.C.)

HOW A BARBER BECAME A HERALD OF THE FACTORY SYSTEM.

SIR RICHARD ARKWRIGHT was a barber who made his name in the then new world of cotton industry. In 1769, when he was thirty-seven, he obtained his first patent—for a water-spinning frame, so named because water provided the motive power. He made further improvements and, realising the importance of concentrating all manufacturing processes under one roof, built many factories. He died a rich man. (Born 1732, died 1792.)

THE MAN WHO INVENTED A SAFETY LAMP WHICH WON THE NAME OF "THE MINERS' FRIEND."

SIR HUMPHRY DAVY was the miners' greatest friend. As a result of his researches he was able to invent the famous safety lamp named after him. Even in an explosive atmosphere, the oil flame—enclosed in its cylinder of metal gauze—burns in safety. The number of disasters it has prevented and lives it has saved is incalculable.

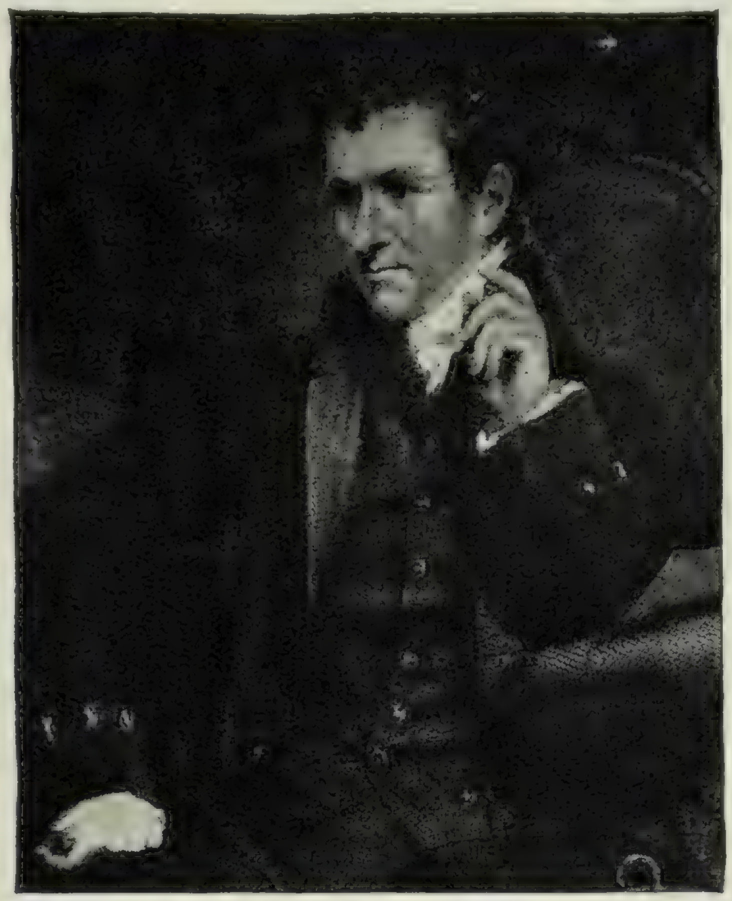
Born at Penzance and educated at the

Grammar School there, Davy was first apprenticed to a chemist, but his remarkable talent soon revealed itself. Among his many achievements was the discovery of laughing gas. To-day we are benefiting from some of his deep electrical researches, and remember his name with gratitude. (Born 1778, died 1829.)

HOW A CLEVER BOY HELPED TO SPEED UP THE WORLD'S WORK.

JAMES WATT was a pioneer of the modern steam engine. A native of Greenock, his delicate health compelled him to receive most of his education at home. His father's financial misfortune threw the young James on to his own resources. Having a taste for mechanics, he became apprenticed to the business of a scientific instrument maker. Again his unsatisfactory health compelled him to leave before the expiration of his apprenticeship. With him, however, he brought a sound knowledge of the use of tools.

Always his mind was occupied with the problem of improving the very crude steam engine of that time, which was so wasteful in fuel as to rob it of almost any practical value. Tirelessly he persevered. He succeeded. And civilisation cannot measure its debt to James Watt. (Born 1736, died 1819.)


Sir Humphry Davy—the miner's friend—who made conditions in the mines much more secure by inventing a safety lamp.

THE MAN WHO WON FAME AS AN ORATOR, WRITER, AND LAWYER.

ROGER BACON was a Franciscan friar who was interested in science and invention. He is supposed to have made the first pair of spectacles and composed a substance closely like the modern gunpowder. Like other advanced thinkers he was often imprisoned for his views. (Born 1214, died 1294.)

HOW THE WORD "VOLT" CAME TO BE USED IN CONNECTION WITH ELECTRICITY.

ALESSANDRO VOLTA, an Italian physicist, was one of the earliest investigators of the wonders of electricity. On his accurate observations much of later electrical knowledge was founded. The Volt, an electrical unit, is named after him. (Born 1745, died 1827.)

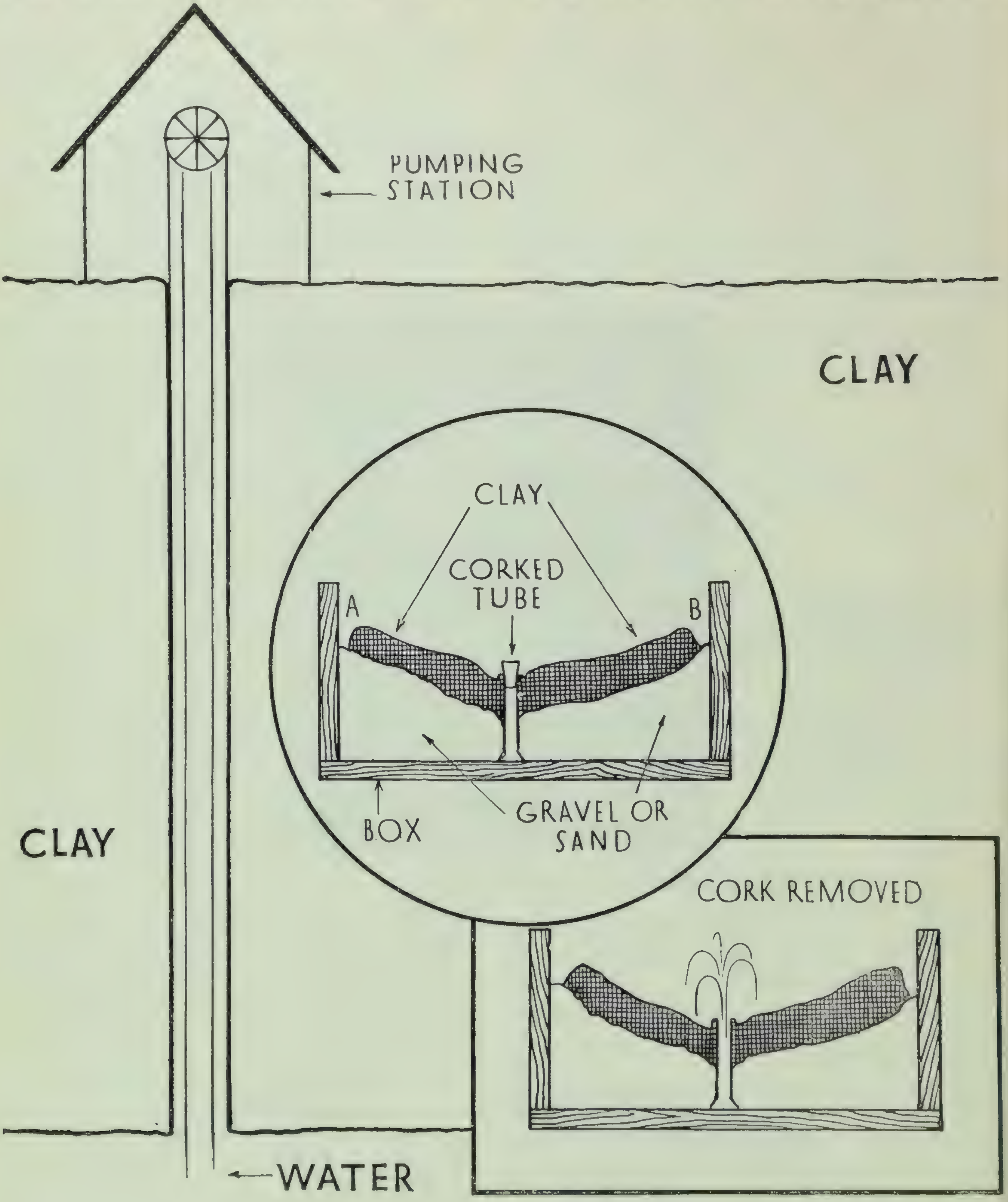
THOMAS ALVA EDISON was probably the most industrious inventor of all time. To his fertile brain we owe the first gramophone, incandescent electric light, the telephone transmitter, the electric train, moving pictures and various ingenious means of telegraphy. In his active lifetime Edison took out more than 1000 patents. Born in a little Ohio town, his first job was as a railway newsboy. In quick time he had ceased selling papers and was printing his own *Grand Trunk Herald*, a novel venture designed to interest the ever-growing number of railroad passengers. It was unfortunate that as a result of an accident in his van-laboratory he received such a blow on the ear that he was deaf until his death. Edison's inventive turn of mind kept his interest in life keen until the last. (Born 1847, died 1931.)

EDMUND CARTWRIGHT'S invention of the power-loom was a herald of the modern factory system. When first revealed at Doncaster, the weavers thought it would deprive them of their livelihood and opposed it tooth and nail. In Manchester the opposition was even fiercer. But the power-loom had come to stay, and in 1809 Cartwright received a £10,000 government grant. He also invented a machine for combing wool, and started factories at Doncaster and Manchester, which, however, did not prosper. (Born 1743, died 1823.)

THE SCIENTIST AND INVENTOR WHOSE IDEAS WERE OF PRACTICAL USE.

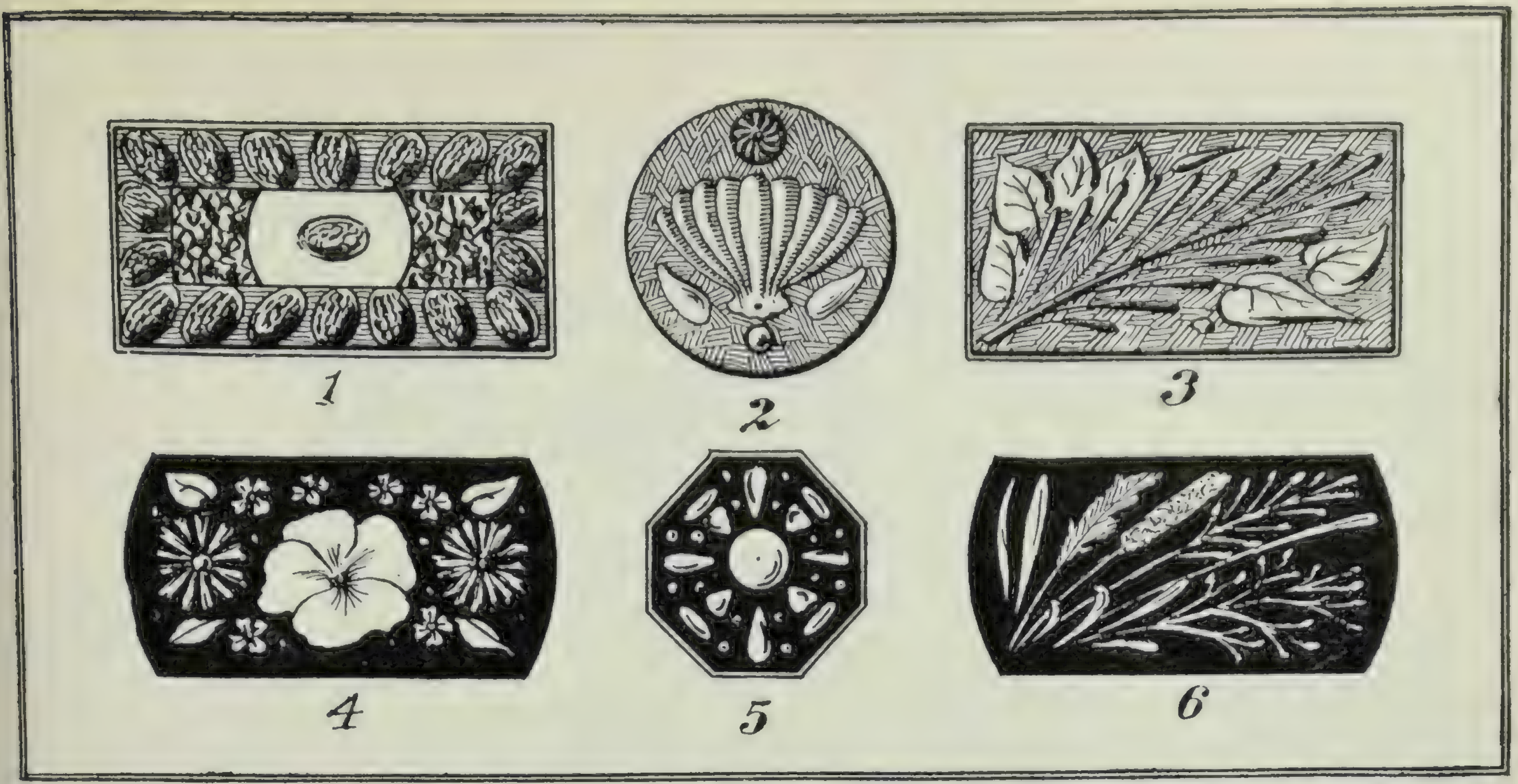
LORD KELVIN was one of Britain's greatest physicists and inventors of scientific apparatus. After a distinguished career at Cambridge, he went as Professor of Natural Philosophy to Glasgow, where he remained until 1899. It was his investigations into the realm of electricity, and the ways in which he put his knowledge to practical use, that won him universal fame and a peerage from Queen Victoria. His idea led to the making of the electric cable. (Born 1824, died 1907.)

MAKE A MODEL OF AN ARTESIAN WELL


PUMPING STATION
CLAY
CLAY
CORKED TUBE
A
B
BOX
GRAVEL OR SAND
CLAY
CORK REMOVED
WATER
CHALK

1. PUT SAND OR GRAVEL INTO A BOX AS SHOWN. HEAP IT WELL UP AT THE SIDES.
2. NOW INSERT A TUBE CORKED AT THE TOP.
3. NEXT COVER THE SAND OR GRAVEL WITH CLAY EXCEPT AT EDGES.
4. POUR IN PLENTY OF WATER AT EDGES A OR B.
5. REMOVE CORK. WATER RUSHES UP TUBE.

Water is obtained in many parts of the world by means of sinking Artesian Wells—London obtains some of its water in this way. The above diagrams (in the circle and rectangle) show you how you may experience the thrill of seeing water spout out of the "earth" through your "boring."



Some attractive box-tops described in the article; (1) Nut shell: (2) Sea-shell: (3) Leaf: (4) Flower: (5) Pebble: (6) Grass.

WORK FOR HAND AND EYE

Are you clever with your fingers ? If so, here is your chance to keep them busy. The instructions below show how many fascinating things, which will keep you interested and amused, are made. For this hobby, expensive materials are not needed. One section tells how to make interesting games and puzzles with paper, and another shows how old boxes can be made attractive by using sea-shells, flowers, and other things easy to find. You can have great fun, too, building a model farm and stocking it with all kinds of animals. Girls are given a special lesson on how to make dainty things for their own use, and special models are described for the boys' benefit. Picture and toy-making are also included in this fascinating section, and diagrams show you what to do.

WOODEN boxes, tin boxes, and even card boxes, if they are strong ones, can easily be transformed into useful and pretty articles. Collect as many as you can and see what *you* can do with them after you have read about the various ways of decorating them.

This idea can be applied best to wood or card boxes, the former for preference. For decoration use broken nut shells. In addition you need some plastic modelling clay, and Plastone or Duroplast can be used. Spread a layer of the clay over the top of the box, and press in the shells to form a simple pattern or design. When the clay sets hard they will be held firm. The small, broken shells make a good background. If any part of the clay is not covered it can be coloured with ordinary water colours, poster colours being best. The shells may be coloured with liquid gold paint to add to the effect, and the work is finally varnished with pure shellac varnish. You can make very pretty and useful boxes in this simple manner.

Bead Boxes can be made in the same manner, using coloured glass beads in place of the shells.

The same idea can also be applied by using sea-shells instead of nut shells, and the work can be carried out in the same manner. When you go to the seaside, remember to collect as many specimens as you can find.

This is a very original way of decorating boxes. First, gather good specimens of all sorts of leaves. Ferns make the best choice, and these can be had in great variety. Collect as many specimens as you can, and press the best ones. To do this, place them in a big book with a heavy weight on top. Leave them for a week. Now, with the leaves you can make a nice design on the box, arranging them to form a pattern or design, or just anyhow. You can paste them on if you use pure gum arabic. See that each leaf is flat and well gummed down. It does not matter if they overlap. A variety in the colour of the leaves will make them look all the better. When the work is quite dry, use pure shellac varnish, and after the first coat is dry, give it another coat. Apply the varnish with a soft camel hair brush. This will allow the leaves to preserve their natural colour.

You can use flowers in the same way, of course, and here you should select those flowers which press best, such as pansies, or any flower which has no large, hard centre. Wild flowers are very pretty and you can get endless varieties in the country.

You might not think of using grasses, but if you look around during seeding time, you will be surprised to find how many entirely different kinds of seed stalks there are, and they are all pretty. Gather them, press them, and then ornament your box with them.

Feather Boxes can also be made, and this will give you something else to collect in the country. You will find all sorts of feathers, and many of them are very beautiful.

We must not forget pebbles. When you go to the seaside collect pebbles as well as shells, choosing small ones, and getting as much variety in colour as you can. The box top is covered with plastic clay and the pebbles pressed in. To finish, varnish the box, and this will make the stones bright and enhance their colourings. If you like you can use pebbles and shells mixed, just as in the examples above you can mix leaves and flowers together.

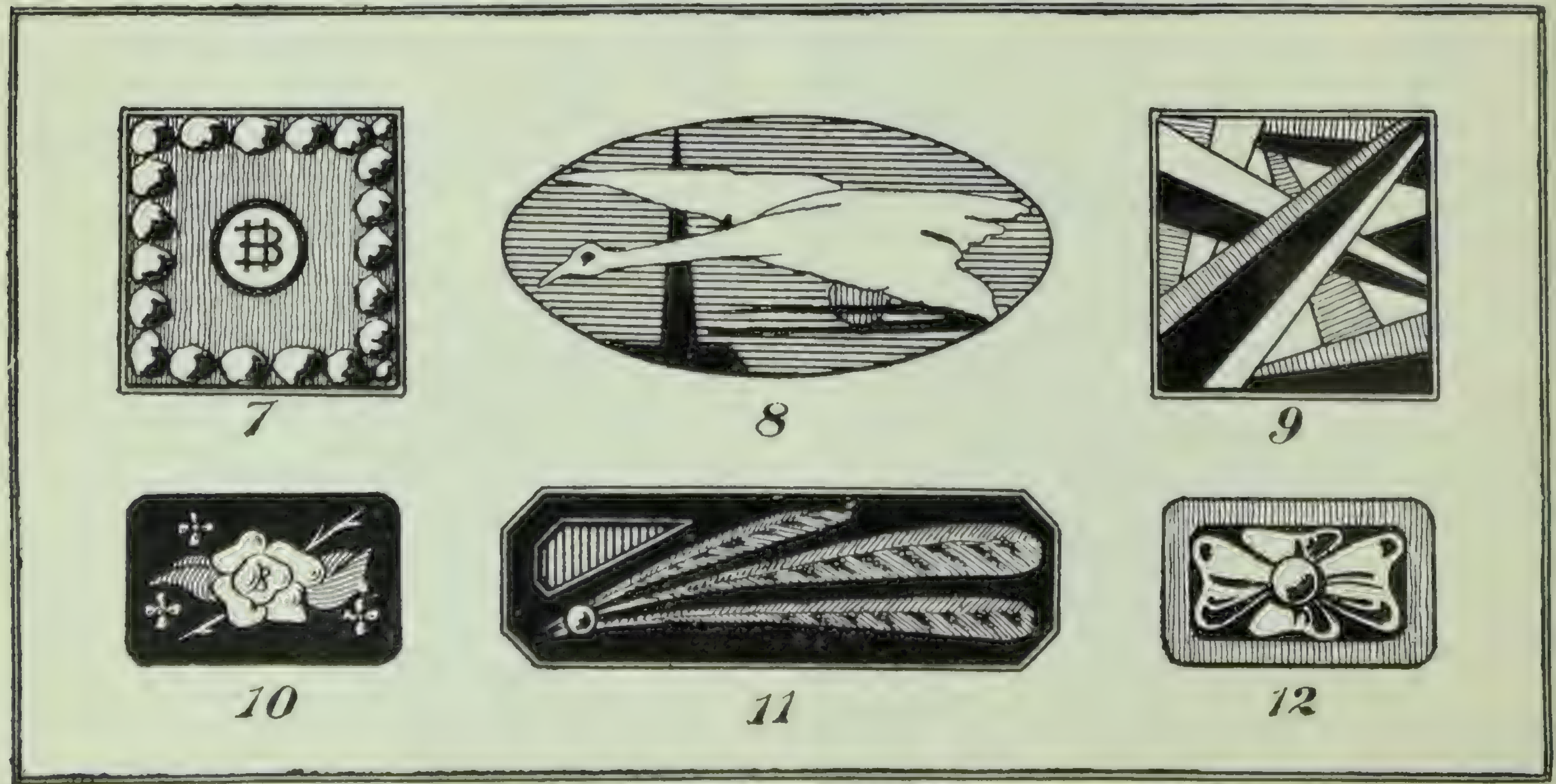
Other pretty boxes can be made with sealing wax. Get two or three sticks of different colours. Just drop blobs on the top of the box, using the colours in turn so as to form an irregular simple design. It is quite easy, and the effect is attractive if care is exercised.

Now we come to another item you need not throw away. Whenever you see a piece of silver or coloured paper such as bon-bons are wrapped in, for example, save it. If you cut the papers into all sorts of shapes and sizes and then paste them on the box to make what is called a jazz design, overlapping them how you like, you will be surprised to find what lovely effects you can get. Another way is to cut the coloured papers and paste them on so as to make a simple picture. Varnish the work when you have finished. The sides of the boxes can be decorated in the same way as the tops.

Now we come to the inside of the box. This must look attractive too, and you can divide it off into sections by using card strips glued into position, so that you can make the box serve as a trinket-box, or a hiding place for any small items. The inside can then be lined with pieces of silk or any other dainty material, pasted in flat, ruffled, or ruffled and padded. Coloured paper may be used, or odd pieces of velvet or plush.

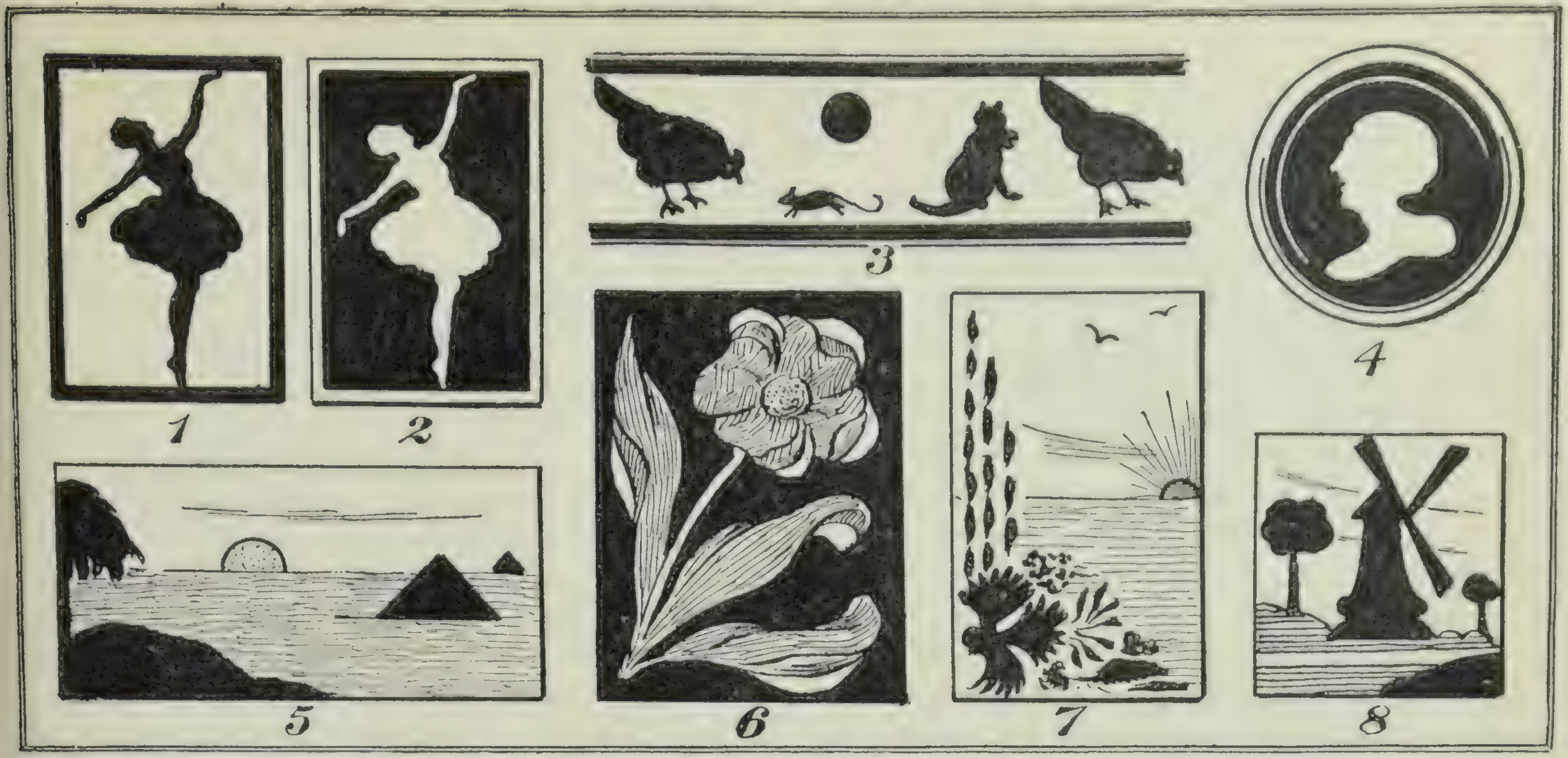
To decorate smooth wood boxes, you can, if you are clever with paints, paint direct on the wood. Use wood painting ground colour to colour the box all over first, this being the background, and then paint or stencil your design with poster water colours, and varnish.

Lastly, we come to modelled boxes, in which case you use plastic modelling clay, and model up a simple design, then colour and varnish it. The illustration below gives suggestions for the carrying out of these simple ideas.



More useful and decorative box-tops can be made; (7) Sealing wax: (8) Paper picture: (9) Paper jazz: (10) Painted: (11) Feather: (12) Modelled.

HOW TO MAKE ATTRACTIVE PICTURES



(1) Silhouette picture, black on white: (2) White on black: (3) Border design: (4) Smoke silhouette on plate: (5) Coloured sand picture: (6) Cut flower picture: (7) Seaweed picture: (8) Paper picture.

FROM time immemorial, savages have, in various ways, produced crude drawings, using wood or stone in place of paper, and a flint or sharp metal in place of a pencil. It is much easier for us to make a picture, for there are so many things to aid us. Here are some unusual ways of picture-making.

DO YOU KNOW WHAT A SILHOUETTE PICTURE IS?

An attractive and simple way to make pictures is the silhouette method, where we have no detail but just the shape in bold outline. Supposing you want to make a silhouette picture of somebody. First, get a good photograph and be sure that it is a side view, or what is called a profile. A front view will not do. Now take the photo and make a careful tracing of the outline on tracing paper. Having done this, retrace on good cartridge paper, using carbon paper under the tracing paper, black the picture in solid with Indian ink and you will have a splendid likeness in silhouette. If the picture is to be framed, choose a frame with narrow black moulding or make your own frame with black passe-partout. A different effect can be obtained by using black poster paper instead of white cartridge paper, with white chalk paper for the retracing, and painting in the silhouette in Chinese white. In this case a gold or white framing or edging is suitable. Alternatively, you may paste a white paper silhouette cut out on the black paper instead of using paint.

If you want to make a number of similar silhouettes for, say, a border design, instead of retracing on black or white paper retrace on stencil paper. All these papers can be obtained from a good stationer or artists' colourman. Cut the stencil out, lay it on the paper or material to be decorated and stencil the design or silhouette in any colour you like. For silhouettes, however, black and white work looks best. You can make a silhouette of almost anything—portrait, animal, bird, building, etc., from a picture with a good clear outline.

HOW TO MAKE ATTRACTIVE SMOKE-PICTURES ON A PLATE.

It is great fun making smoke silhouettes. These can be made on plates, or tiles, or anything white and smooth. Make a paper cut-out first, and fix it to the article with just a spot or two of gum here and there. Now, if you are making a picture on a plate, turn the plate face down, with the cut-out fixed to the underside, light a candle, and move the plate over the flame so that the smoke of the candle blackens the plate. Do not let the flame touch the paper cut-out. When the plate is black all over remove the paper cut-out, taking care not to smudge as the black will easily rub off. The paper cut-out is best removed by sticking a pin into it, turning the pin and pulling briskly. Do not put your finger to the edge. You will now have a splendid silhouette on the plate, and if you want to preserve it you can make it permanent quite easily by blowing on some fixative. This is obtainable in bottles, together with mouth spray, and is used for fixing chalk and pastel drawings, etc. Just blow a light spray all over the work and let the fixative dry. You can then hang up your plate as a decorative ornament.

A NEW AND FASCINATING WAY TO DRAW AND COLOUR FLOWERS.

Here is a most unusual way to draw flowers, and one which is extremely realistic. Get a good piece of cartridge or Whatman's drawing paper and sketch your flowers in pencil in the usual manner. If you cannot draw, make a tracing from a good copy. It is better, however, to try to copy real flowers. Having made the drawing, colour the work as carefully as you can. Up to now you have done nothing unusual, but the next step makes the work quite original. You take a sharp knife and partially cut round the outline of the leaves and petals, and this allows you to lift these up. Take one petal or leaf at a time, raise it and curl it by running the petal between the thumb and a round pencil. Make the movement two or three times and a natural curl will result, and the picture will look something like the example shown in the illustration. It stands out and looks as real as a picture can look. If you want to frame your work you must make a frame, or have one made, which has a fair space between the back and the glass.

You may think that sand is peculiar material with which to make pictures. It can be done, however. First of all you need coloured sand. Take a piece of good stout white card, and draw on it a very simple picture on the lines suggested. Now paint in the objects, one at a time, with pure gum arabic, and when the gum is tacky, sprinkle on sand of the colour required. When the gum is quite dry brush or blow off the surplus sand and you will have a very original and attractive picture.

HOW TO MAKE PICTURES FROM PRETTY PIECES OF SEAWEED.

Next time you are on the seashore look for really pretty small specimens of seaweed, such as are found among the small rock and boulder crevices and in the little pools. Select the best, getting as many colour varieties as you can, and dry them in the sun. Make up a simple picture by gumming the weeds on to a stout white board. To add to the effect you can paint a simple sky and sea background on the board before you fix on the seaweed. These pictures, like your flower paintings, may be framed in an air space frame.

The final suggestion (No. 8 in the diagram) shows how you can make very original pictures simply by cutting out pieces of coloured paper and pasting them one over the other until your picture is complete. The background papers are first pasted down, and the last pieces are those in the foreground.

PLEASANT PASTIMES FOR BUSY HANDS

GIRLS like making things, especially pretty or useful articles, and there is always the pride of having made them oneself.

Here are some novel pin-cushion suggestions. Get an ordinary walnut, and split it open with a knife without breaking the shell. Having obtained the shell in two halves, clean out the inside, and polish the outside. Now make a little pad and stuff it well with sawdust. Press this into the nut, and over the top glue a piece of velvet, tucking the edges in round the shell. Finally, paint the outside of the shell with liquid gold paint, and when this is dry give it a coat of pure shellac varnish to preserve its lustre.

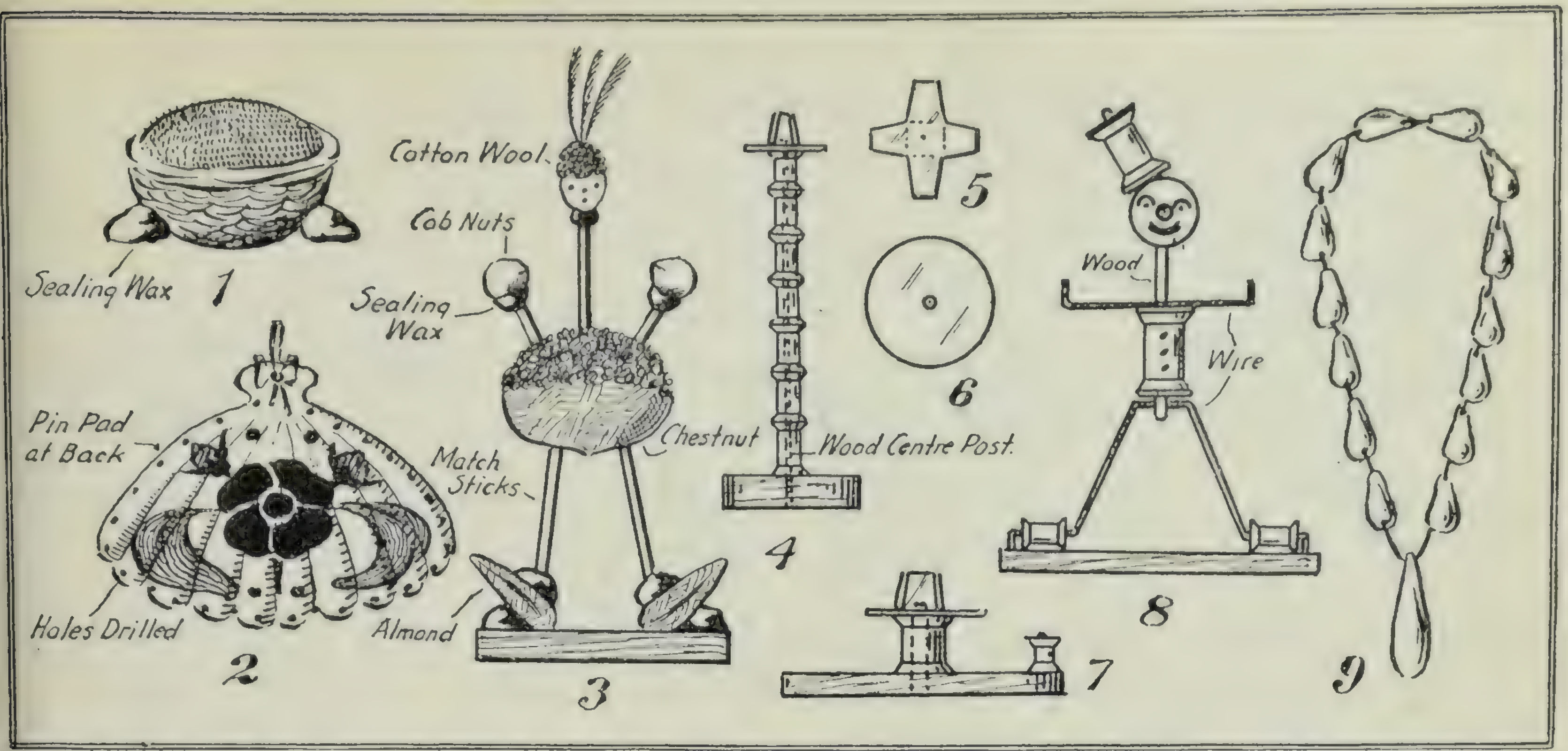
HOW WALNUT SHELLS CAN BE MADE INTO STAMP MOISTENERS.

If you only use half the shell you can use the other half in quite a different way. Clean, paint and varnish it as before, but instead of fitting a pin-pad inside, push a wad of sorbo rubber firmly into the shell, the inside of which has been smeared with glue. This makes a novel stamp moistener, the rubber being damped and then used to moisten the stamps. Small feet can be made with blobs of sealing wax.

HOW MANY USEFUL NOVELTIES CAN BE MADE WITH NUTS.

The nut pin-cushion is of course useful only as an ornament in which to stick a few odd pins. If you want a bigger one get a large shell of the kind illustrated and make a stuffed pad to fit it. Drill small holes all round the edge of the shell with a fretworker's drill, and over the pad sew a piece of velvet, using the drilled holes to sew through. Now paint a simple design on the front of the shell, using oil colours for preference, or poster water colours as an alternative ; then varnish and your work is complete.

Various other little novelties can be made from nuts. The one illustrated is composed of nuts, match-sticks, feathers, cotton wool, a piece of wood, and blobs of sealing wax. The drawing shows you how it is done, and



Novelties for girls to make; (1) Walnut pin cushion: (2) Decorated shell pin cushion: (3) Nut oddity: (4) Cotton reel candle-stick: (5) Metal candle cup cut-out: (6) Metal drip plate: (7) Another style of candle-stick: (8) Cotton reel oddity: (9) Shell necklet or bangle.

you can make others equally amusing. These can be used as ornaments or mascots.

The drawing shows a simple method of making a candle-stick from cotton reels. The base is of wood, the reels are passed through and glued over a wooden rod fixed to the base, and the candle holder is cut from a piece of tin, bent to shape and screwed to the top. To finish, paint the candle-stick, first with wood-painting ground colour, and then in a simple design with poster colours, finally varnishing it. Alternatively, plain enamel or cellulose paint may be used with good effect.

The other kind of candle-stick illustrated has a round wood base with a large reel in the centre, to which is fixed a tin candle cup as before, with a circular tin drip plate, which may also be fitted to the tall pattern. Another reel serves as a handle, and the candle-stick can be enamelled or painted as you wish.

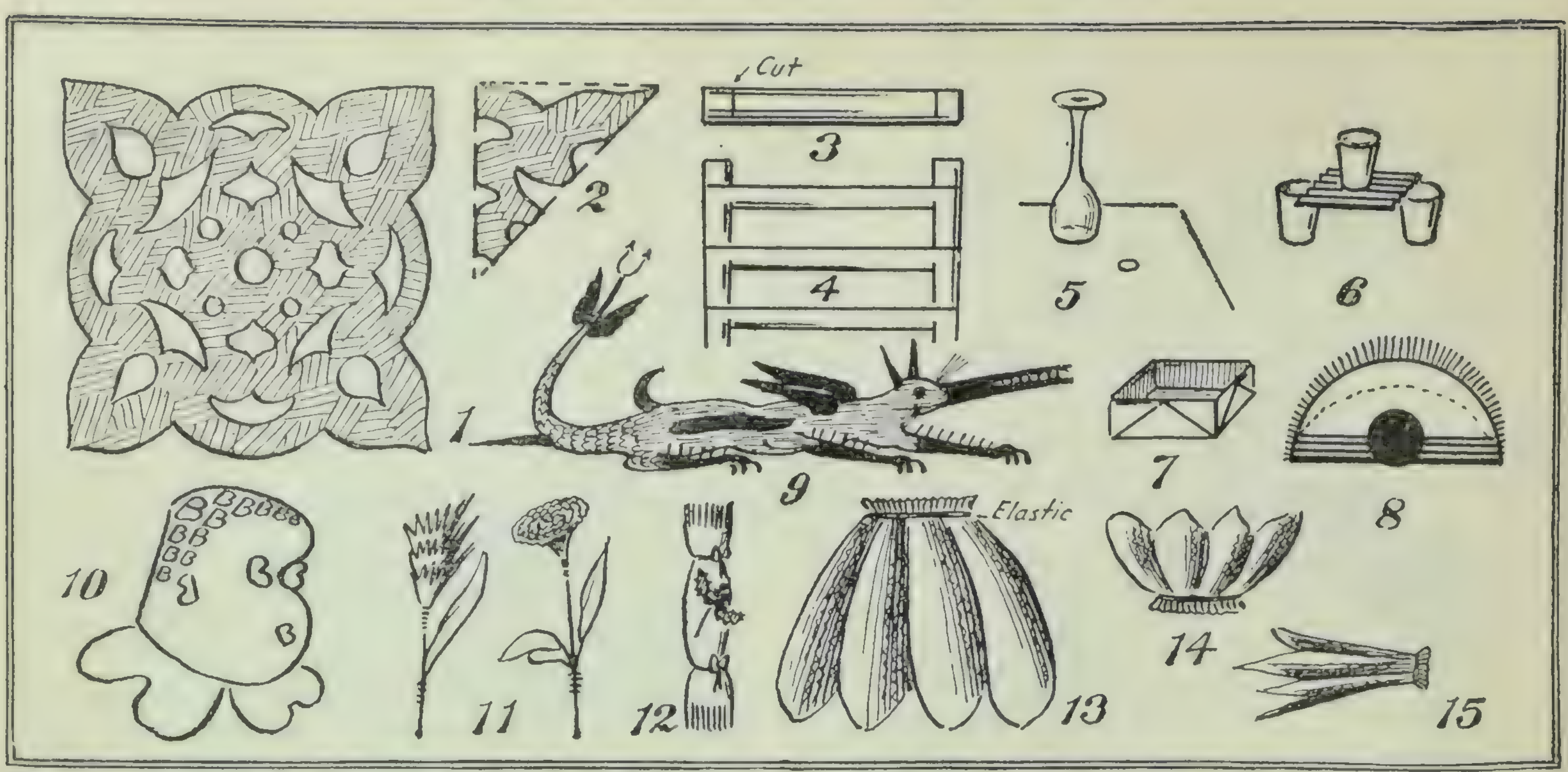
Here is a novelty, or a " crudity," which is useful as well as ornamental. Make a base of wood and then with round wood dowels or wooden meat skewers and one or two reels, build up the weird " traffic cop " illustrated. All you need is a small drill, some glue and a piece of stiff copper wire. Paint a humorous face on the face reel and some buttons on the body reel, paint the boots black and then varnish the whole. The hat should be white, and white paper sleevelets may be passed over the arm wires, or plasticine or clay built round them. The novelty makes a useful stand on which to hang rings and other articles of jewellery, and will be a cheery addition to the dressing-table.

Beads and necklets can be made from all kinds of things, as you will find on turning to the article on bead making on page 555. Small shells can be drilled and strung as shown and gold painted and varnished. Use silk elastic for threading. Plain wood beads may be had in all shapes and sizes, and these may be painted with colours in simple designs, then varnished and strung to form necklets or bangles.

FUN WITH PENCIL, PAPER AND SCISSORS

A JOLLY evening can be spent with nothing more than paper and pencil, and it is well to have plenty of ideas of this kind for your parties, as a restful hour or so after much romping is a pleasant change.

This is a pastime which calls for thought and for deft fingers. Give each member of the party a square piece of paper. The idea is to see who can make the prettiest paper-tearing pattern. The paper is folded in half diagonally, then folded again three or four times ; then pieces are torn out anyhow with the fingers. When the paper is opened out you will have a lovely geometric repeat pattern which is quite complicated. If you care to do the work neatly with good white or coloured paper, using scissors instead of your fingers to form the pattern, you can make beautiful dish or table mats by this method.



Paper games, tricks and puzzles ; (1) Paper tearing pattern: (2) How paper is folded and torn: (3) Paper ladder, how to roll and cut: (4) The ladder formed: (5) Coin, glass and paper trick: (6) Paper and glass balancing trick: (7) Paper bag for boiling water: (8) Paper caps: (9) Weird animals: (10) Figure faces: (11) Crepe paper flowers: (12) Paper Crackers: (13) Paper dress: (14) Upper part of paper dress: (15) Paper cuffs or gauntlets.

This is rather a surprising little trick. You make a paper ladder for your audience in a most amazing way. Take a large sheet of paper, roll it up neatly and firmly, partly cut through each end with a sharp knife as shown, then taking hold of the cut ends, one in each hand, give the roll a shake and down drops a long ladder—quite a realistic one too !

SOME SIMPLE TRICKS WHICH PROVE VERY AMUSING.

This is a simple little trick which anybody can perform, and here again paper is the important essential. Spread a piece of white paper on the table, and on it lay a sixpence. The next item must be prepared beforehand. This consists of a wine-glass to the rim of which is gummed a piece of white paper, the same as is spread on the table. Place the tumbler upside down on the paper, and the piece of paper gummed to it will be quite invisible. Tell your audience that when you place the glass over the sixpence, the coin will immediately disappear. Of course it does, much to their amazement. Then when, having announced your intention, you take the glass away the sixpence will reappear, and the onlookers will certainly wonder how it is done ! It is a simple but very effective trick.

Here is another trick in which we use paper for the solution. Place two tumblers on the table, about six inches apart, and ask your audience if any one of them can balance a third tumbler on the other two, using only a piece of paper with which to do it. They are sure to say it is impossible, and when that moment arrives, you simply fold the paper backwards and forwards as shown, open it partly out and balance the third tumbler quite easily. It is simple when you know how to do it.

Perhaps you do not believe that water can be boiled in a paper bag, but this also is quite simple. Make a paper bag as shown, and seal all the overlaps so that the water will not run out, then half-fill it with water. Place it over a low light, and the water will boil, but the paper will not burn.

Now let us all have paper and pencil and draw funny faces. Most of us like doing this. First try a face made up of any number only, then one made up of any letter. The illustration will show you what is meant. Have a competition to see who can make the best effort.

LET'S SEE WHO CAN DRAW THE FUNNIEST ANIMAL ?

This gives us the idea of drawing funny animals. It is quite a jolly game. Give the players pencil and paper and tell them to draw the weirdest animal they can imagine. Birds with teeth, snakes with legs, and all such oddities may be included. You must not look over anybody else's work, of course, until all have finished ; then the one who is judged to have drawn the weirdest animal is the winner.

It is quite easy to make your own crackers. Use tissue paper for the inner wrapping, and coloured crepe paper for the outer wrapping.

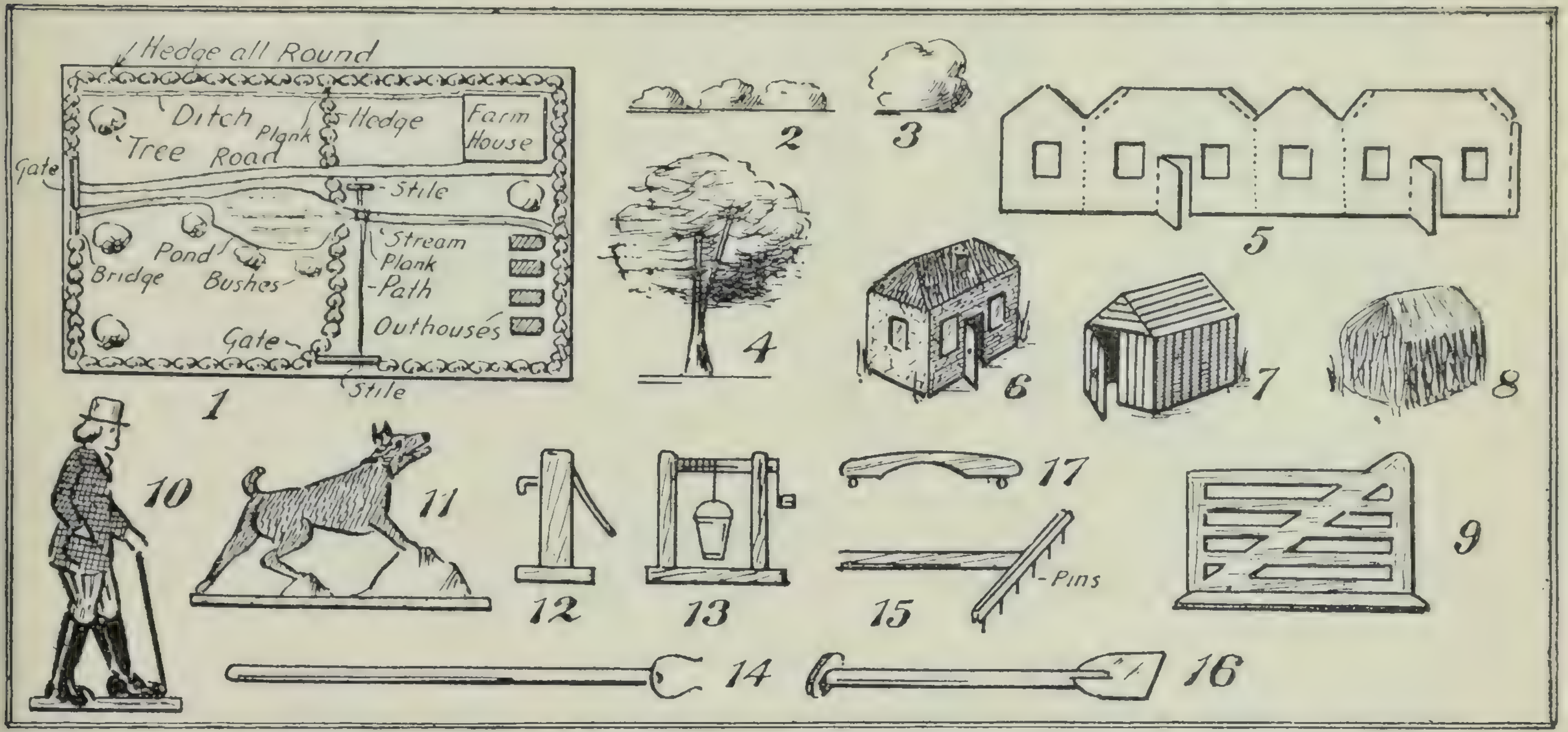
Put whatever you are going to have inside in the paper and roll, then tie each end with silk or ribbon, and fray the ends with scissors. Scraps can be pasted on for ornament, or small sprigs of holly or mistletoe tied to the cracker. Paper caps are easily made from coloured crepe papers, cut and gummed as shown. You can make all kinds of shapes and designs. When you have made each cap, fold it and roll it, and put it inside your cracker.

Making paper flowers is a jolly pastime and not at all difficult. You need two or three rolls of crepe paper of different colours, green, yellow, and red being a good choice, and also some covered wire. The illustration gives you an idea how various flowers and leaves are formed, and also shows you how to wire them to the covered wire stems.

The illustration also shows how simple it is to make party dresses from the same sort of paper. These can be quite effective, but the wearer must take care to keep away from fire.

Whether it is winter or summer, do not forget the paper chase. This is one of the jolliest and healthiest games you can have. A big bag of paper for the hare, and half an hour's start, and away! You will come home like ravening wolves clamouring for the next meal.

NOW MAKE YOUR OWN MODEL FARMYARD



How to make a model farm or garden; (1) Planning farm or garden: (2) Hedges: (3) Bushes: (4) Trees: (5) Farmhouse or house cut out: (6) House made: (7) Outhouse, shed, or garage: (8) Haystack: (9) Gate: (10) Farmer or person: (11) Dog, or animal: (12) Pump: (13) Well: (14) Pitchfork: (15) Rake: (16) Spade: (17) Pail carrier or yoke.

ONE of the most interesting of all toys is the model farm, or garden if you prefer it. Whichever you make, the same ideas apply to both. Next to having a real farm or garden, what could be better than models?

Here are the materials you will need. First, quite a lot of modelling clay—coloured Plasticine, or Duroplast, or Plastone, the latter two being white clay which you can colour yourself, and which sets hard. You will also find a paintbox handy, pieces of wood, cardboard, cut out pictures and other odds and ends.

First of all you must plan your farm or garden. Make it as big as you like. This will depend on how much space you can spare, but the bigger the better, of course. Get a thick plywood board of the size your farm is to be, and all over the upper surface spread a fairly thick layer of modelling clay. This has to be modelled up, and if you want to keep the clay plastic while you are working, or if you have to leave it for some time, just lay a damp cloth over it.

You must have a pond, and a stream, of course, so simply model out hollows for these. Your ground will be irregular, so you model it up and down and make small mounds, hills and slopes and mark out one or two paths, lanes or roads. If you are making a garden, you just mark out and model up flower-beds, paths, and so forth.

Now colour your ground realistically with your colours, and when you have finished give the whole surface a good coat of pure shellac varnish. When this is dry, apply another coat. Sprinkle some real sand on the paths, while the clay is plastic and this will stick. Press in a small piece of broken mirror where the pond is to be and this will look quite real.

HOW TO BUILD AND STOCK YOUR MODEL FARMYARD.

It is quite easy to make hedges, bushes and trees look real. For hedges, get some cotton wool and dip it in green paint or ink. Then screw it into clusters and glue it to the modelled ground-work. Bushes are made in the same way, but stand alone. To make a tree, stick a real piece of twig in the clay while it is plastic and then fix a blob of coloured cotton wool on top of the twig. Round the pond you can stick a few clusters of cut pieces of real reed grasses. You will be astonished at the reality of your work.

At the end of the main path will be the quaint old farmhouse. This is made by first making a cardboard cut-out and folding it as shown. The roof is made of an oblong piece of card of sufficient size to overhang the sides of the house a little. The oblong is scored across the middle and bent to form the roof. Then cover the farmhouse roughly with a thin layer of clay or paint it to make the walls look natural, and on the roof, which is also covered with clay, press some pieces of real straw to give the effect of a thatch. Stick some red transparent paper behind the windows.

The cow-sheds and outhouses can be made in the same manner, and all can be coloured and varnished. Remember when making the various items to keep some sort of proportion. Do not, for instance, make the bushes bigger than the trees, or the reeds round the pond higher than the bushes, or the farm watch dog bigger than the cow-shed. A haystack is easily made by building up a clay-covered card model and pressing straw all over it.

The hedges serve for the fences, but we need a gate and a stile. Cut these from card and colour them naturally and roughly, gumming them to the groundwork in the best positions. A gate should lead into the garden or field, a stile to a gap in the hedge.

THE FARMER AND HIS WIFE RULE OVER THE MODEL FARMYARD.

There are the old farmer and his wife, and the farmer's beautiful daughter, the milkmaid and the workers. Sketch them all on paper, paste the paper on card or wood, and cut them out. Then mount them on little wood bases so that you can stand them anywhere. If you can get coloured pictures of the right size to use, all the better. The animals and birds are made in the same way. If you do not wish to make the population of the farm, small metal models may be bought for a copper each.

For the farm you will need some more general items such as a pail, a pump, a spade, and so forth. Pails and troughs for the pigs can be made from small tins, a pump can be carved from a piece of wood, a well can be erected as shown, and the spade can be made from a small piece of wood slit at one end to take a piece of tin in the manner indicated.

SOFT TOYS ARE FASCINATING TO MAKE

NO doubt you are all fond of toys of some sort or another, and perhaps those of you who are younger are fond of breaking them in order to see what they are made of. It is even more interesting to make them.

IT IS QUITE EASY TO MAKE AND STUFF SOFT TOYS WITH RAGS.

Soft toys are those which are made out of soft material such as rags and felt and such things, and the insides are stuffed. These are quite easy to make. Golliwogs were once very popular indeed, and here are instructions for making a really fine one. The instructions will apply just as well for the making of any type of doll.

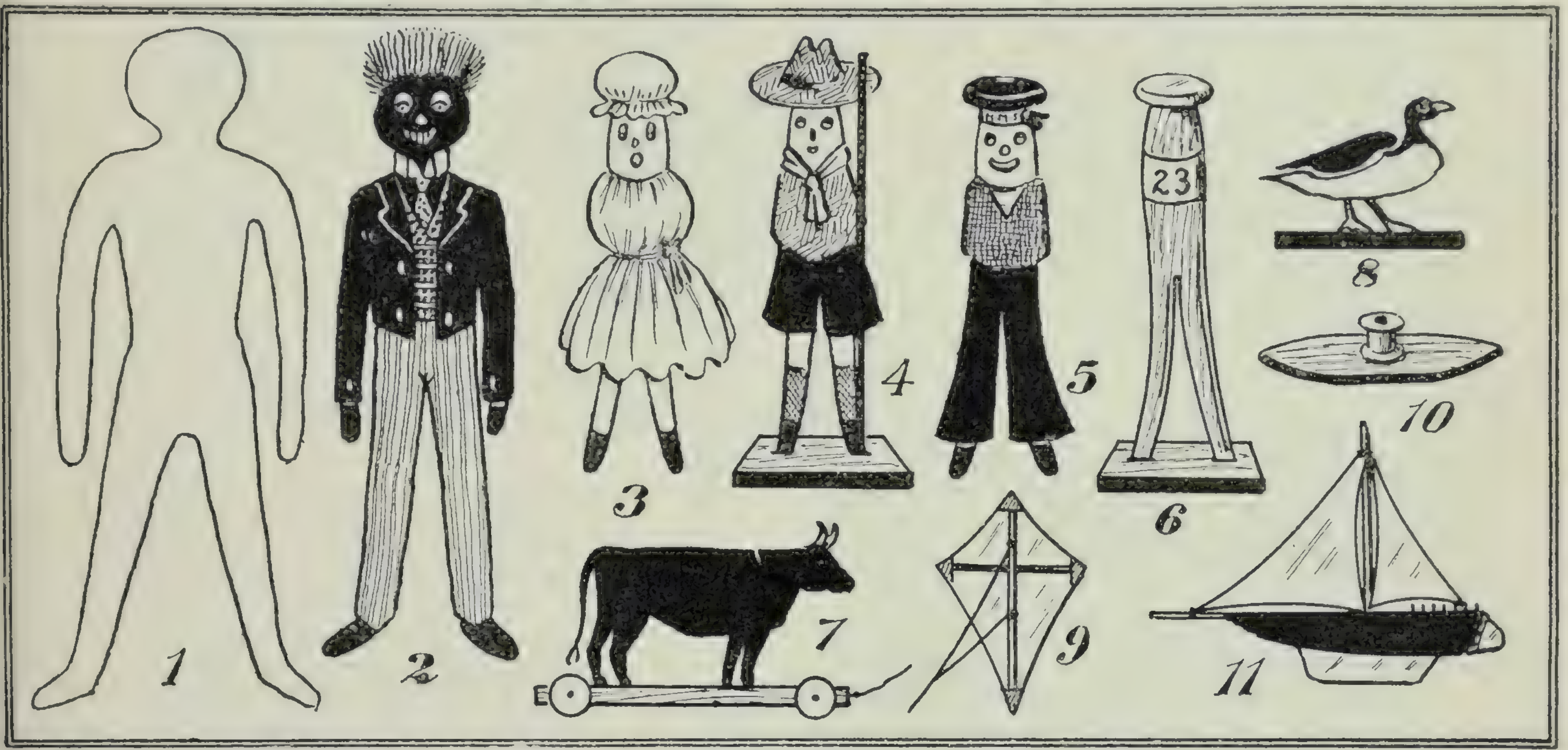
You will need some strong material or fabric, and canvas will serve very well. You also require some saddler's thread and a needle, some sawdust, wood shavings, or paper pulp. The first is best.

Cut out two pieces of cloth as shown in the drawing, and join them by sewing neatly and strongly all round the edges, leaving a small hole at the top for filling. Now turn the canvas inside out and pack tightly with your filling. When you have packed it firmly, sew up the top. Use thick white canvas or drill for preference.

You can now make the face by colouring with Indian ink, using Chinese white for the eyes, and deep red for the mouth. Sketch the face on the canvas in pencil before you colour. Paint the hands and the feet black, and make the hair from black wool. Use plenty of wool, cut a number of short lengths, and then double them and sew to the head in small bundles. Rug wool is suitable, as it is naturally curly.

Now you can dress your Golliwog to please yourself. The drawing suggests how this may be done. You can make the trousers, and, say, a blue jacket, and a striped vest, and then make a spare suit to measure for Sundays, and don't forget the collar and tie—a starched linen collar and a silk tie, and make one or two spare collars, so that you can send the dirty ones "to the laundry" every week. Any sort of doll or cuddly animal can be made in the same manner if you cut out your material in two pieces.

If you want to make some of these little animals, instead of using canvas take the material most suitable for your article. Real rabbit skin might be used for Bunny, if you can afford it. You can get a skin for two shillings. Astrakan or woolly stuff will do nicely for Doggy, and plush for Teddy. Remember, however, when you cut the two pieces to have them back to back, otherwise you will have two odd pieces. Glass beads can be sewn on to make effective eyes.



Toymaking ; (1) Golliwog cut out: (2) Finished golliwog: (3) Clothes-peg doll: (4) Clothes-peg scout: (5) Clothes-peg sailor: (6) Clothes-peg skittle: (7) Pull-along cow: (8) Noah's Ark animal: (9) Kite: (10) Submarine: (11) Sailing boat.

HOW TO MAKE DAINTY LITTLE DOLLS WITH CLOTHES PEGS.

You can make curious little dolls with clothes pegs of the kind illustrated. Just dress them to please yourself, using any odd pieces of fabric, and paint the face in. If you want them for a novelty you can mount them on a wood base so that they stand up. The boys can make scouts, or jolly sailors in the same way. Why not make a number? What could be jollier than a whole platoon of scouts?

Before we leave our clothes pegs, it is well to point out that quite good skittles can be made from them. Simply mount each peg on a wood base, gum a piece of paper round each, and on the paper print a number with Indian ink. You score according to the numbers on the pegs which you knock down, and this will keep you in practice in arithmetic, especially if you make odd numbers instead of the usual tens.

KITES ARE QUITE SIMPLE TO MAKE, AND IT IS GREAT FUN FLYING THEM.

Many kinds of pull-along toys can be made in the following way: When you see a really nice coloured picture of a horse, or any other animal that you like, cut it out and paste it on a piece of fairly thick wood. Now cut this out with a fretsaw, which is very handy for making toys. Mount the animal on a wood base, and fit four wheels to the base as shown. These are made from cotton reels. To finish the toy, screw a small hook-eye into the baseboard and fix a piece of string to it.

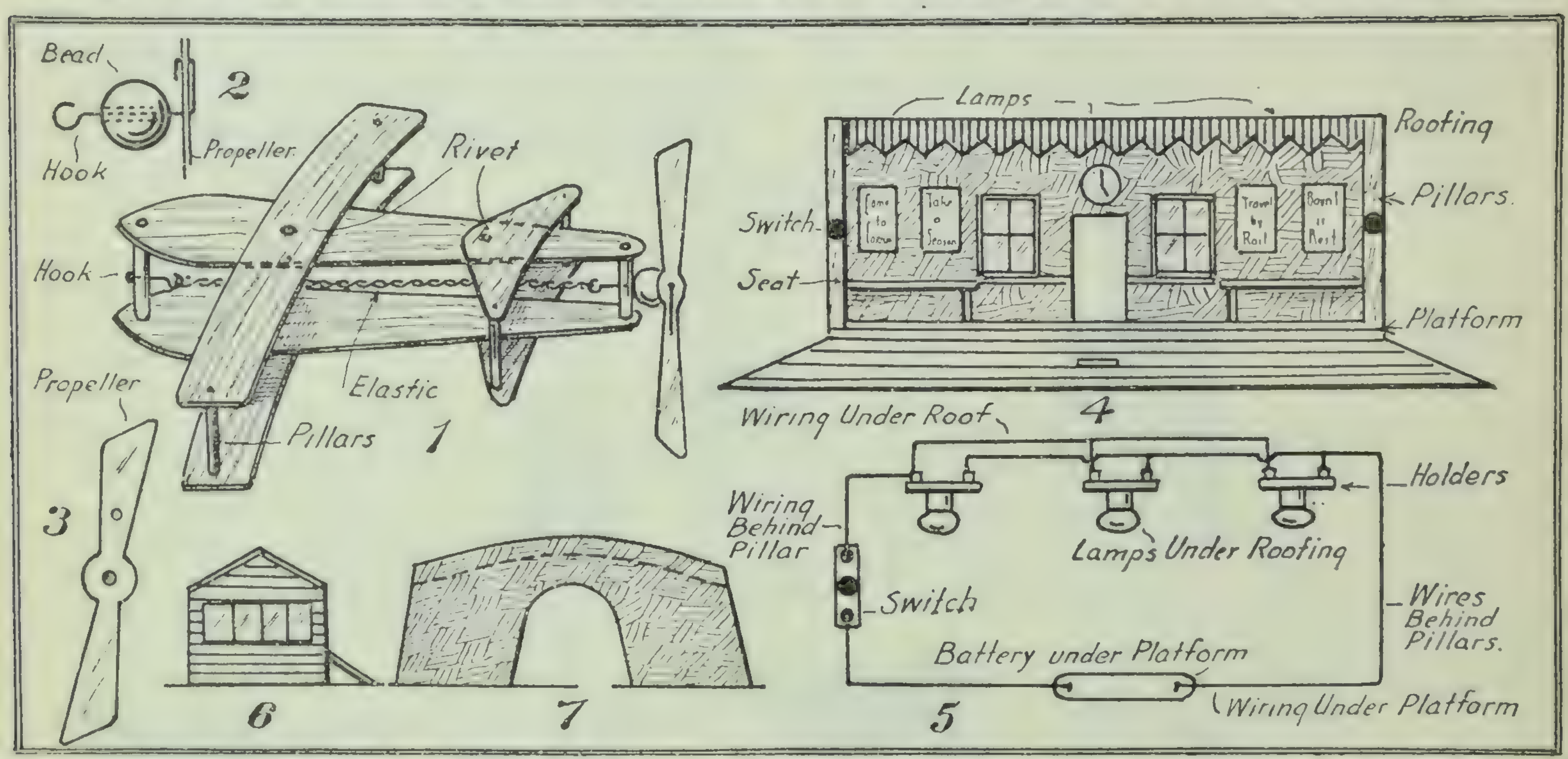
Small cut-out toys can be made in the same way as the pull-along animals. Cut out small coloured pictures of animals or other interesting things, and mount them on wood. Cut with the fretsaw, and mount on small wood bases. In this way you can make up Noah's Arks or Zoos, painting the animals after a good sandpapering has made them smooth.

Kite flying is good fun in the summer, and you can make a good kite if you try. Cut out the material, which should be good, strong, coloured linen, and sew corner pockets neatly. Use light canes cut to length for the cross-bars, and fit the string in the manner indicated to give balance. This is all you have to do to make a well-designed kite, and you can roll it up to carry it.

A simple submarine can be made out of a piece of wood and a cotton reel, fixed with a screw, which passes through the hole in the reel into the base.

Now, boys, make a sailing boat. The drawing shows you how to do it. Carve the body from a block of soft wood, make the keel from a piece of soft lead, and hammer it into a slot cut in the bottom of the body. Make the mast from a piece of cane or round wood, glue it into a drilled hole in the body, and make the sails from oiled linen. A few pins round the edge of the aft end will enable you to set the jib sail and the rudder can swivel on a hinge, and be set by way of the sail setting pins.

WORKING MODELS MADE FROM THIN WOOD



Boys will love the models described below and will find them quite simple to make. (1) Aeroplane: (2) Propeller fitting: (3) Propeller cut out: (4) Railway station: (5) Station lighting system: (6) Signal box: (7) Bridge.

IN this kind of model-making we have to consider two important points, namely, to make our machine as light and as strong as possible.

HOW TO MAKE A MODEL AEROPLANE WITH YOUR OWN TOOLS.

The drawing illustrates a really simple model, and if you make it carefully it will fly splendidly. The body is made up of two pieces of thin plywood and small-diameter round wood or dowel pillars which are fixed by glueing and the use of fine pin nails. Make this part first and drill a small hole in the front and back pillars. These take small wire hooks which carry a stout, square-section, elastic band. A smooth, round bead is passed over the end of the back hook. The propeller is then cut from thin metal, tin, copper, or brass being suitable, and is slightly shaped, the holes being punched with an awl in the positions indicated. It is then attached to the hook so that when you twist the propeller round the elastic twists or winds up. After fully winding, you release the propeller and it smoothly revolves at good speed. The band should be greased to ensure even, smoother running and longer wear, but if it breaks at any time it can easily be replaced.

The wings are made from the thinnest plywood, and fitted to the body in each case by means of one pin or rivet only, end pillars of wood being placed for spacing purposes. As your head and tail wing pieces swivel round, you can have practice in setting direction when flying the model. Now try to make this simple and interesting model. Experiment until you get it quite perfect. Remember that balance and accuracy in shaping is important, and that light and delicate but strong work is your object.

IT IS QUITE EASY TO MAKE A STATION THAT LOOKS REAL.

The next illustration shows a good, simple design for a model station. The entire work is built of wood and is easy to put together. Little posters can be drawn and coloured to give effect, or cigarette pictures can be used for the purpose. The clock can be drawn, or you can use a small watch face if you have one.

The fitting of this electric lighting installation is simple. Arrange two or three flash lamp bulbs in a row, in holders. Screw the holders under the roofing of the station. Then wire up in the manner shown in the drawing, taking the wires to the back of the roof, down the side pillars, and under the platform, where you also place the small 4½-volt battery. The operating switch can be placed where convenient; an ordinary wireless push-pull switch will serve the purpose splendidly.

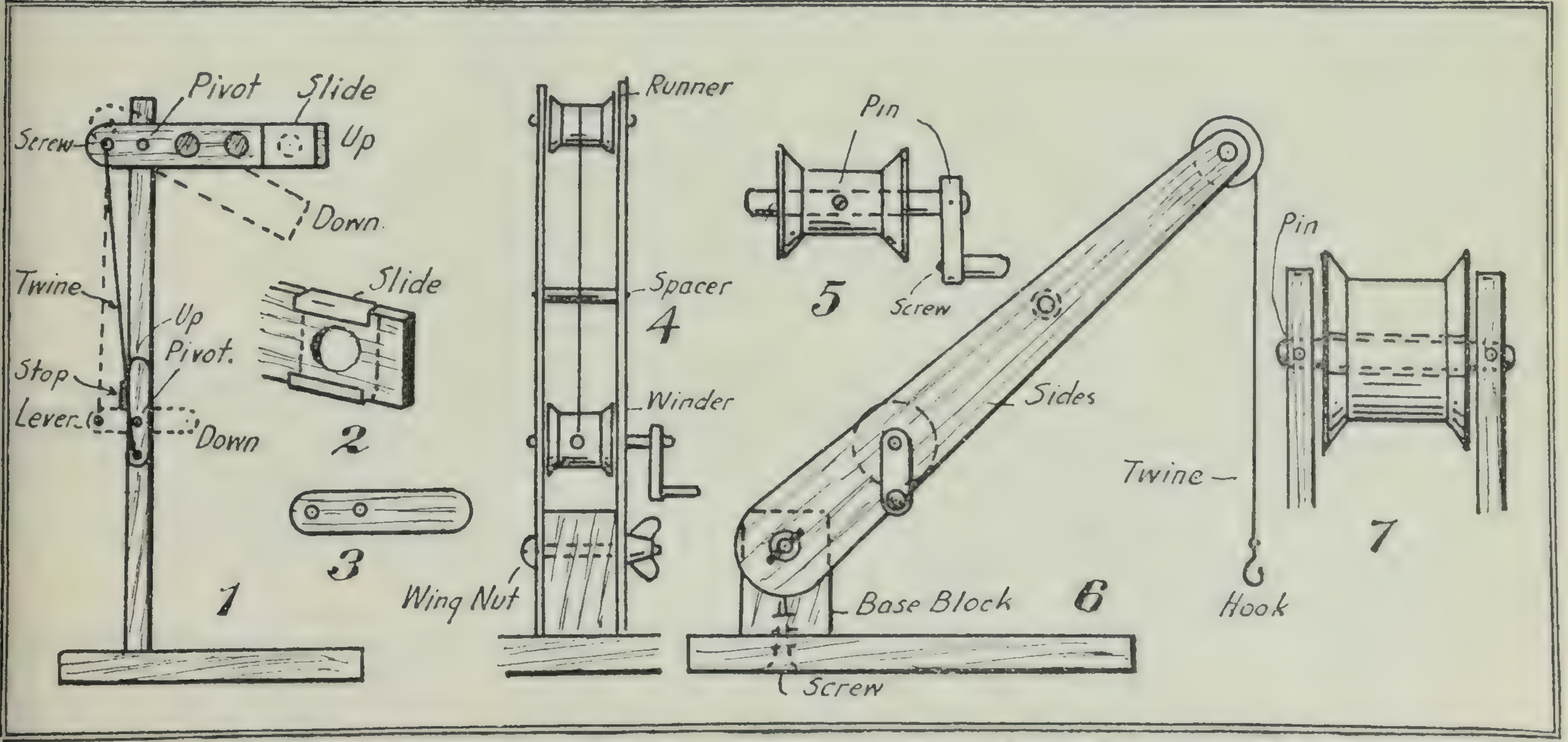
HOW TO BUILD BRIDGES AVD SIGNAL BOXES TO USE ON THE RAILWAY.

Bridges and signal boxes are easy to build up, and some simple suggestions are shown in the drawing. They can be made of wood framing and plywood, coloured or stained to give a realistic effect. Glass or celluloid can be used for the signal box windows and much useful work can be done with modelling clay, Duroplast or Plastone being recommended, as these can be coloured with ordinary colours, and set hard.

Signals can be made in the manner illustrated. Red and green transparent paper is used for the lights, with a simple sliding obscurer. The obscurer or slide is made from a thin piece of tin. The ends are bent round the signal arm so that the tin can be made to slide along the arm. Another simple device (see No. 3 below) is fitted to set the signal up or down.

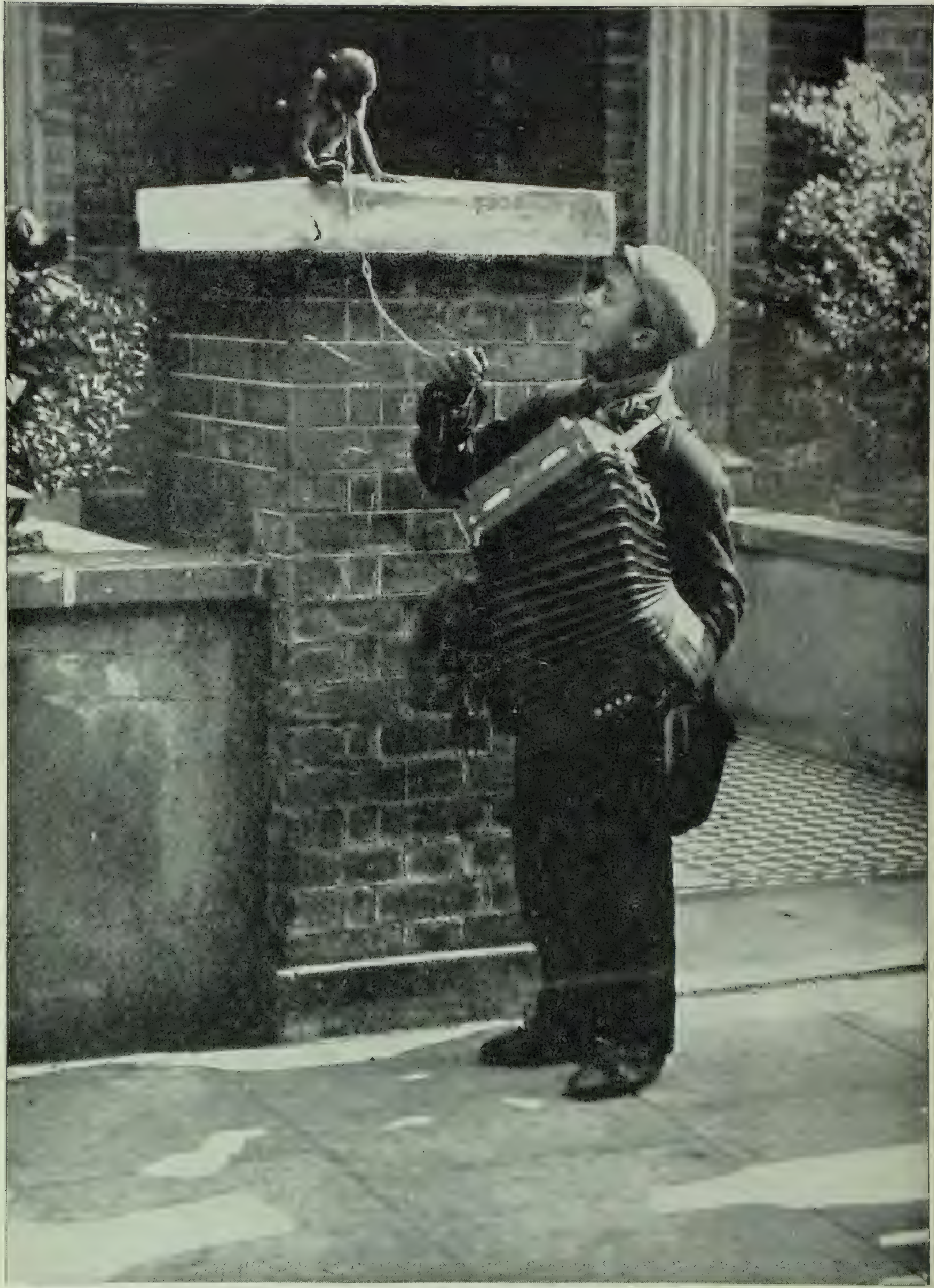
HOW TO ADD A CRANE TO YOUR MODEL RAILWAY.

A small crane will be a useful addition to your model railway. The one illustrated can easily be made with two cotton reels and some odd wood. Make the base piece first from a piece of thick wood, and to this fix the wood crane block by screwing from the underside of the base. Now make the two side beams from wood and drill to take the block swivel, the two reel axles, and the spacer bar. When you have done this, fix the beams to the base block by means of a bolt and wing nut. Next fix the winder reel. Here the axle piece is of round wood which fits tight in the hole of the reel, but loose in the side beam holes. To ensure that the axle piece is fixed to the cotton reel drive a fine pin nail in as shown. The top reel runs loose on the wood bearing pin, which fits tight in the side beams bearings. When you have adjusted the two reels, fix the round wood spacer bar by glueing and pinning. Complete your crane by attaching a length of twine to the lower reel, passing it over the upper reel, and fitting a small hook to the end. The crane swivels round at the base and can also be set at any angle. Finish by staining or painting. Once you become really interested in model-making with stripwood and plywood, you will find yourself planning out new models on paper. It is jolly to draw out a scale plan of a model and then build from your plan and find that all works out as designed. Begin with simple models, such as boxes, signals, huts, etc., and work your way up to those requiring many parts and much delicate fitting.



More models to interest boys who like to make their toys with their own hands; (1) Signal: (2) Slide obscurer for signal: (3) Operating lever for signal: (4) Cotton reel crane, back view: (5) Fitting of winder reel: (6) Crane, side view: (7) Fitting of runner reel.

A HAPPY MUSICAL PARTNERSHIP



The Italian organ-grinder with his monkey had a rival in the Italian and Swiss boys who used to play jolly tunes on their reed and wind instruments. The monkey was an attraction and was often trained to collect the pence.

Even the youngest children love the rhythm and sound that can be produced on simple instruments, and gay tunes fill them with delight. This young conductor seems to be very serious as she calls her "band" to order.

MECHANICAL MUSIC

We live in a mechanical age. Our factories and workshops hum with the noise of efficient and almost human machines which work expertly for us. We travel on land and sea, in the air or under the waters—all by mechanical means. What wonder, then, that mechanical music should appeal to us. Elsewhere wireless broadcasting is dealt with. Here we read of the creation and development of that music which is produced by clockwork mechanism and by air.

MECHANICAL music has sometimes been described as lazy man's music. To some extent this is true, but it is not wholly true if we look at the world to-day with its greater speed and rush in business, and even in pleasure. It would be quite impossible for many people to become even tolerably expert with, say, the violin, the clarionet, the organ, or the piano. What then? Are these people, with so little time for leisure, to lose all the beauties of music which can be brought, in its mechanised form, into every household? Moreover, some beautiful works, which would be quite impossible for the amateur player, can be enjoyed instead of being murdered.

THE hurdy-gurdy is probably the earliest form of mechanical music, but it is a name which is very loosely applied, ranging from the street organ, which depends upon a handle being turned, to a wheezy old organ—the real hurdy-gurdy. Both are rapidly disappearing before the march of wireless and the gramophone; both have played their part in the amusement of children and in assisting a beggar to obtain his livelihood.

The real hurdy-gurdy came from France, where it seems to have been produced in the thirteenth century, so that it has quite a long history. In the first instruments a wheel was turned and it caused a vibration amongst some strings which made a droning noise rather than a tune. Such an instrument was doubtless used by strolling singers to act as a subdued accompaniment to their songs, which were often composed by the roadside, and the tune made to fit the instrument which was used for accompanying the song. Four centuries later the hurdy-gurdy in France resembled the guitar in appearance and the wheel at the foot of the instrument was turned in order to give that droning noise which served in place of the actual plucking of the strings. The French were rather fond of this instrument, but the Germans seemed to think it was too mechanical, and as a result they trained their young people to play various instruments. Possibly from this cause Germany took the lead amongst continental nations, producing that fine string of composers to whom we owe so much, whose names are known the world over and whose music is played as much to-day as when it was composed.

HOW THE HURDY-GURDY AND MUSICAL BOX PLAYED MECHANICAL MUSIC.

Then came the musical box, which is also being lost sight of to-day since the piano-player, the wireless set and the gramophone came to take its place. The musical box is not nearly as old as the hurdy-gurdy, dating back only to the eighteenth century. At this period snuff-taking was extremely fashionable, and the greatest ingenuity was shown in the design of the snuff boxes. Many were embellished with really beautiful miniature paintings ; these are greatly sought after to-day. Others were of gold and silver with dainty filigree work ; others again depended upon their shape for their attractiveness.

Then came the mechanical snuff-box, and someone thought that one which played a little tune when it was opened would have a great appeal. So came the musical snuff-box and these were so fashionable that no one who mattered would be without one. The notes are made by the varying length of the steel teeth of a comb, which come in contact with small steel wires set upright upon a revolving cylinder of brass. The tune is made up by the order in which the steel studs are arranged upon the cylinder, and it is surprising to find that several tunes may be played from the one cylinder by the skilful manner in which it is studded with these tiny spikes. A singularly sweet tone is produced, and there is little to go wrong with the clockwork when the instrument is well made.

WHEN PHOTOGRAPH ALBUMS PLAYED TINKLING LITTLE TUNES.

A favourite type of musical box of the time of our fathers was a photograph album which, when opened, played a dainty little tune. Sometimes disastrous results followed the handing over of the family album to some nervous individual who had not suspected that it was also a musical box. Sometimes they were dropped and the mechanism totally spoilt.

Musical boxes are obtainable to-day in all kinds of disguises. A well-known and very interesting type is the musical cigarette or cigar box. When the lid is raised a tune commences, in tinkling sweet tones, and plays itself out in cheery manner. In this type of musical box the mechanism is contained between the real bottom of the box and a false bottom. The key is placed underneath the box for winding.

Some musical boxes play more than one tune on the same cylinder. This is made possible by a careful arrangement of pins on the brass roll. A moving of the cylinder to right or left brings a new set of pins into action and thus a new tune is played.

The teeth of the comb in a musical box act like the reeds in a mouth organ, except that in the latter instrument the reeds are set in vibration by the force of air—the player blowing out or drawing in air through the reeds. Thus the reed principle has made possible other types of mechanical instruments, more elaborate than the little musical box.

HOW MUSIC IS CAPTURED, AND PLAYED FROM A GRAMOPHONE.

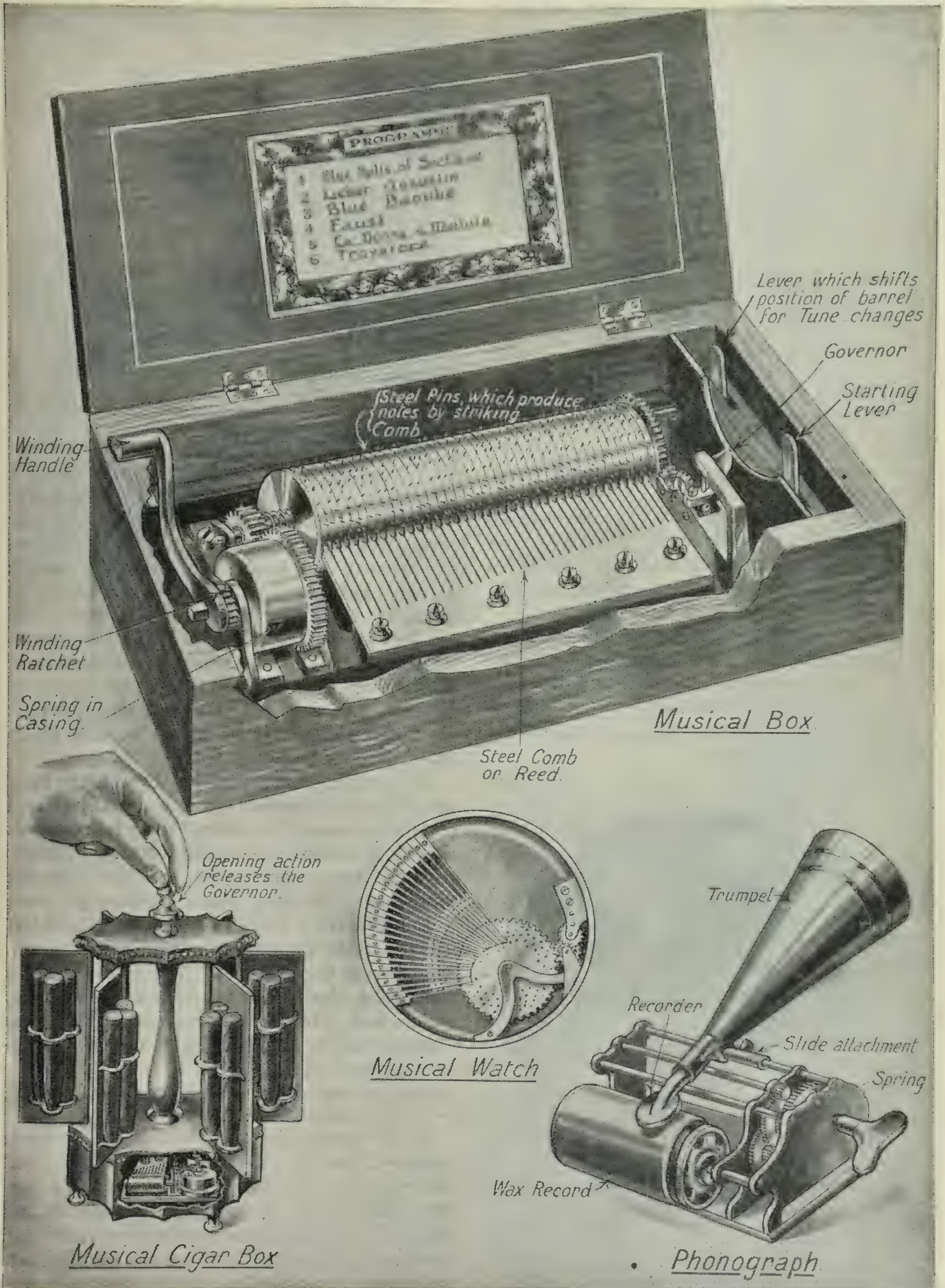
It has been found that instead of a brass cylinder, sheets of stiff paper or card, with holes in various positions corresponding to the reeds, may be used. Instead of a striking of the reeds by steel pins, there is a forcing of air, from bellows, through the reeds. This sets them quivering in turn and the vibrations bring forth the sounds that make up the tune.

Many types of mechanical musical instruments using the perforated cards are made in the United States, but nowadays the idea has been developed to produce an instrument far superior to any imagined in the olden days of musical snuff-boxes.

The perforated cards are now made into rolls, and these rolls have been made, by a skilful arrangement of bellows and jets, to produce that marvel of modern mechanical music, the player piano, described and pictured on pages 129, 130 and 131 of this book.

Again, the gramophone, with its electrical recording on a wax disc of any kind of music or speech, has taken the place of the simple musical box. The old tooth-and-pin instrument could only play simple tunes, and these were all of the same bell-like kind of tone. The gramophone is able to give a faithful representation of all the instruments of an orchestra, from flute to drum or double-bass. What is more important, it can give speech clearly, whether spoken or sung. Every noise or sound rising in the recording room when a record is being made is reproduced with faithful clearness and tone when the record is played. The old musical box gave tunes ; the gramophone gives life—as far as sound will reproduce it. Musical boxes are limited in the number of

HOW MECHANICAL MUSIC IS PRODUCED


Lever which shifts position of barrel for Tune changes
Governor
Starting Lever
Steel Pins, which produce notes by striking Comb
Winding Handle
Winding Ratchet
Spring in Casing.
Musical Box
Steel Comb or Reed.
Opening action releases the Governor.
Trumpet
Recorder
Slide attachment
Spring
Musical Watch
Wax Record
Musical Cigar Box
Phonograph

The first drawing in the picture above gives you a detailed view of the workings of a musical box that plays six tunes from one cylinder. Below are two types of secret musical boxes, a cigar box and a musical watch, both working on the pin and comb principle. The phonograph, forerunner of the gramophone, is seen on the right.

tunes available—and that is a small number, but the multitude of gramophone records available to-day is so great that the only limit is that of the purchaser's purse.

But this marvel of modern mechanical music had to grow, by man's genius, experiment and patience, from very simple beginnings. People laughed at it when it first appeared, harsh, scratching and indistinct. But people laughed at the idea of flying in the air, of driving on the roads in horseless cars, of sending people with safety and comfort over the sea in iron ships without sails, of rushing along steel rails drawn by a fire-eating locomotive.

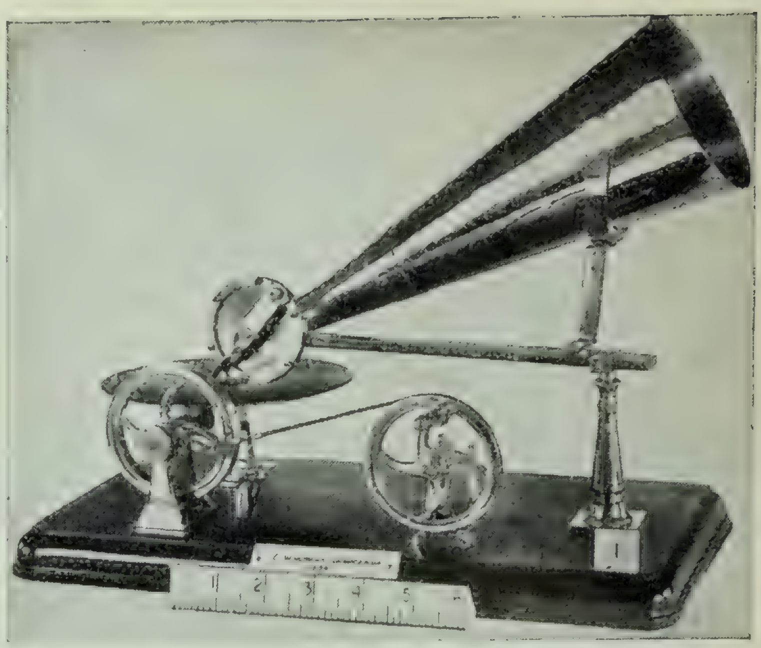
They laughed—they scoffed—but the inventors worked on. The story of the gramophone's birth and childhood is our next concern, and it is truly an interesting tale of perseverance and skill.

HOW THE NATIVES WERE AMAZED AT THE MAGIC MUSICAL BOX.

The gramophone is certainly one of the marvels of the nineteenth century, improved beyond recognition in the twentieth. We take up a disc of black composition and notice its surface scored with minute lines. Suppose we could say to a native of the depths of Africa or South America that here was the most magnificent piece of music ever composed, and then proceed to put that innocent looking disc upon the portable gramophone—what exactly would he think ?

In point of fact this experiment has been tried, with disastrous results, by an explorer who thought that he was giving his men a rare treat. Some of them fled into the forest and were never seen again, whilst those who summoned up courage to remain determined to discover the source of the white man's magic. They waited their opportunity, and when his back was turned one native broke up the records and tried his best to eat them, while another took the inside out of the magic box and was disappointed that he found no one in there with a voice ! The first thought that by eating the magic he would be able to do what the box had done !

In the gramophone's early days, records were made from cut wax and were much smaller than those used to-day.

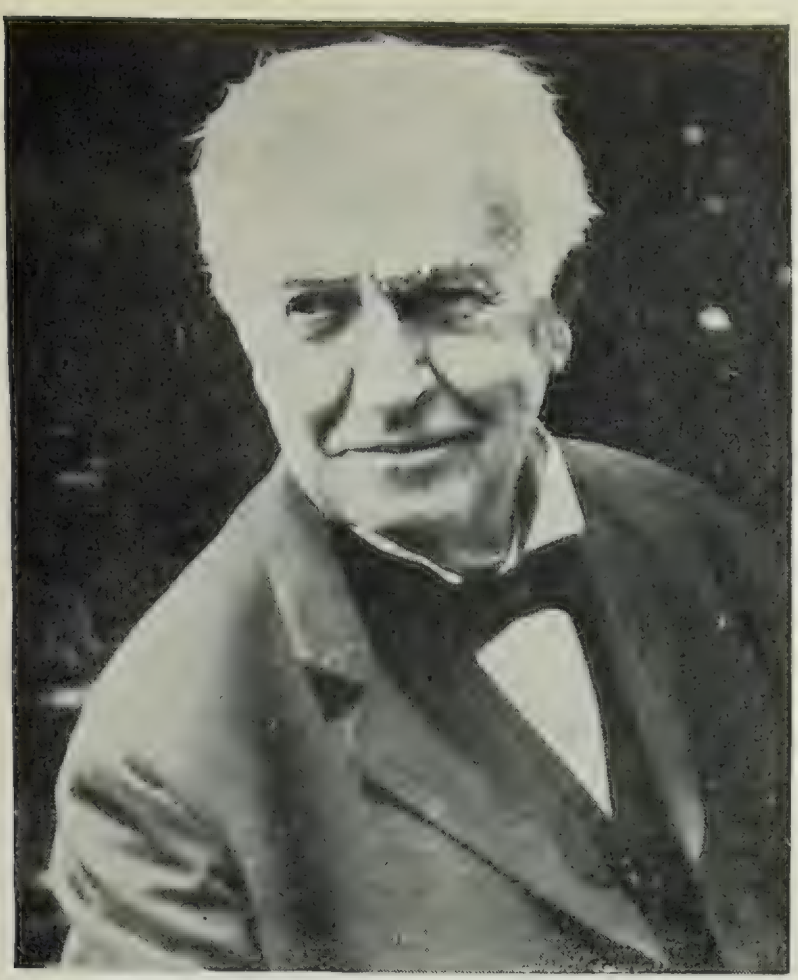


Berliner improved on the phonograph and produced the curious gramophone seen above, which was the forerunner of our present models.

The gramophone had its beginning in a quaint machine which did not actually record sounds or allow of the sound to be reproduced. The first record was made upon a cylinder covered with soot, and recorded certain vibrations. Nothing much in this, perhaps, but it did start others on the road to what was called the phonograph. Sometimes a note struck upon the piano will have an effect upon something else in the room, a vase, perhaps, which will vibrate in sympathy. This was another pointer on the way to a sound reproducing machine.

THE MAN WHOSE INVENTIVE BRAIN DISCOVERED MANY MARVELS.

Next came that magician of the modern world—Thomas A. Edison. Edison had already patented many inventions. He was interested in all the experiments which had been made in the previous twenty years and then, in 1876, he took out a patent for his new machine. It was called the phonograph, and though rather crude it was the first apparatus to pick up sounds, record them on a cylinder



Thomas Alva Edison, magician of the modern world. Among his many inventions were the dictaphone and phonograph. His career was full of incident and romance. As a boy, he earned his living selling newspapers, producing his own paper in his spare time. Later, as a result of his many experiments, he became known as the world's greatest inventor.

and then allow of their reproduction by passing over the cylinder a second marker which was connected with a funnel. This latter portion of the phonograph increased the sounds which were picked up from the revolving cylinder.

HOW INVENTORS EXPERIMENTED TO DISCOVER THE BEST TYPE OF RECORD.

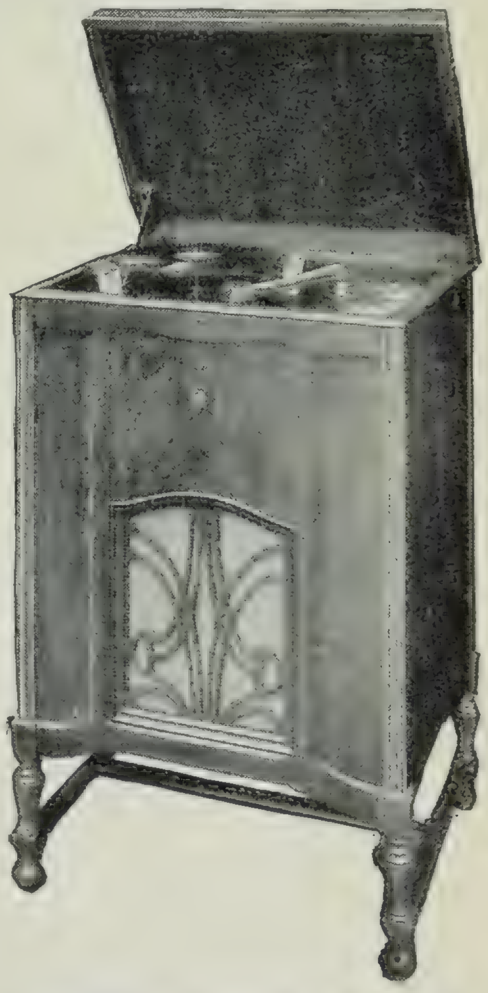
Probably none of those who heard these first records given to the world ever dreamt that Edison's invention would prove anything more than an interesting toy, and rather an infliction at that, since the sounds were distorted far more than the crudest loud speaker of ten years ago distorted the voice or music from the microphone. But Edison was one of those people who were never content to leave a thing half done. Once he had got the principle of sound recording and reproduction he strove his hardest to get rid of the terrible rasping tone, though at first with small success. Once the novelty of possessing them had worn off, many who bought phonographs in those days were only too glad to sell them for a fraction of their cost. The early phonographs had one advantage which the present gramophone lacks—they would receive as well as reproduce impressions. It was possible to put on a cylinder and get a friend to speak into the machine so that what he said could be given to the world. The dictaphone of to-day, used by authors and business men to dictate their work, is the descendant of the old phonograph, and a most useful machine it is. The wax cylinders can be pared down when the message has been transcribed, and used again and again.

HOW PEOPLE LISTENED OPEN-MOUTHED TO THE FIRST PHONOGRAPH.

Others who worked at the improvement of the phonograph evolved by Edison were Graham Bell and C. S. Tainter. The former's name is now associated more particularly with the telephone, to which he had already turned. Bell called his talking machine a graphophone, and even now this word is used in connection with one well-known make of gramophone.

For some time the wax cylinder machine was the only kind of talking apparatus, but it was realised by all that something more would have to be done if the phonograph was to become really popular. They had large horns, too, in many cases and yet the sound was not always very distinct. Soon the machine was seen in the streets, and your fathers will remember the day when they spent a copper to listen to the wonderful machine, having to take a pair of receivers and stand round with other listeners, the centre of an admiring, yet distrustful throng.

Ten years after Edison had produced his phonograph—that is, in 1887—Emile Berliner produced his gramophone, giving it the name which is so familiar to us to-day. But it was a vastly different instrument to the magnificent machines which are a delight to the musician as well as to the ordinary person. Berliner's first machine was on the same principle as regards the cylinder as



Gramophone recording has now been linked to wireless telephony, and the radio-gramophone is a marvel of modern science.

Another type of radio-gramophone, a table grand. In a radio-gramophone the vibrations from the needle are conducted through the valves of the wireless receiving set and come as sounds through its loud speaker.

the earlier phonograph but there were several improvements that made for better reproduction. When, however, he went on to propose, in a further specification, a glass disc record on which a coating of some substance would be laid for the stylus to cut into, the inventor was clearly on the right path. He also introduced the now familiar disc turntable.

Such a record did not last very long, for the needle quickly cut through the beeswax and other materials which Berliner tried upon his glass disc. The same objection had been found with the wax cylinder phonograph. The inventor tried again, and now he made a metal disc upon which the sound markings could be etched in a manner similar to that employed for etching pictures upon copper plates. In this way Berliner got what is now called the master record and from it plastic records could be produced. But all this took a very long time and records for ten years after Berliner took out his first patents were a source of irritation rather than a joy to the musical ear.

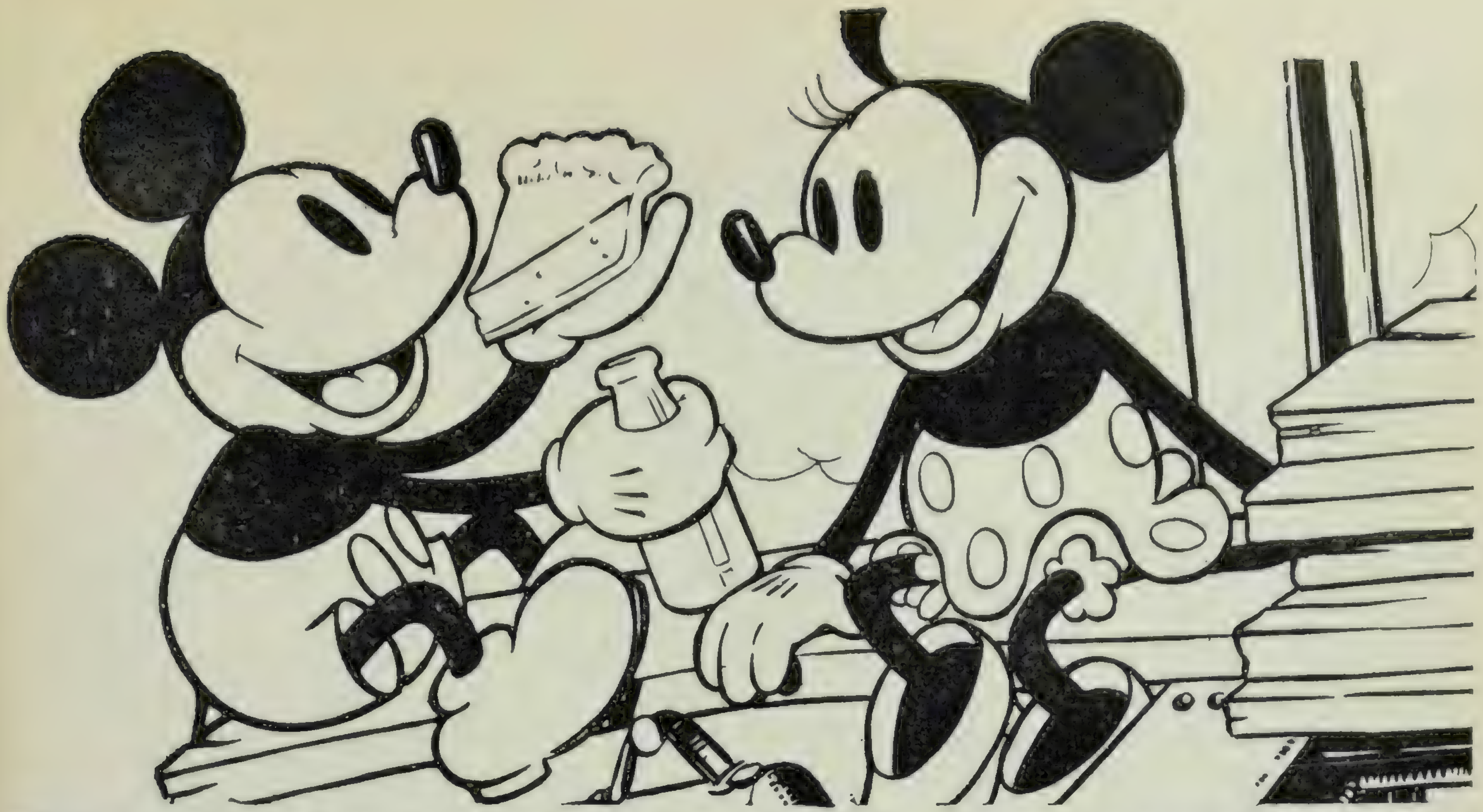
THE WONDERFUL COMPOSITION, WHICH COSTS £200 A TON, USED FOR MAKING RECORDS.

Since those early days there has been great progress made in the gramophone, and particularly in the making of the records. No longer does chance enter into their production. First, of course, there is the recording to be done, and it is always desirable that this should take place in specially designed studios. Often this is not practicable and the possibility of echoes and other disadvantages have to be faced. The singer or the instrument to be recorded is placed at a certain distance from the microphone or microphones, and the cutting tool rotates upon a disc of soap-like material. This is then dusted with graphite in order that it may be electrically conductive, and now it goes to a copper-plating bath and thus becomes the master-matrix. To-day several processes are possible, but here we may consider only one which is largely employed. From the negative matrix is produced a positive plate which is sometimes called the mother-matrix, and from this the working matrix is made. The actual records can now be stamped out from this matrix by the presses. A recent development, which is being rapidly adopted in the big record-making establishments, is what is called " growing " a series of negatives upon the original record. This process saves making a second wax impression.

The actual making of the record is a fascinating process, and it is done on a huge scale in the great factories which have sprung up since the gramophone became the wonderful instrument that it is. Shellac is the basis of a record, and as this material costs about £200 a ton it can be imagined that records cannot be much cheaper than they are unless a substitute can be found. It is possible to mix various substances with the shellac, and at one factory alone about 15,000 tons of composition are used each year for making records. The material is ground to a fine powder and mixed thoroughly and afterwards it is heated and made into what are called biscuits. The biscuits are heated again after having been finally shaped, and then, under a great pressure, they are stamped out to become actual records.

IS THE GRAMOPHONE MORE WONDERFUL THAN WIRELESS ?

It is only within the last ten years that the gramophone has become the wonderful instrument which we know, and nothing has helped so much to that improvement as the development of wireless. The makers of gramophones were at first greatly concerned, fearing that with the introduction of broadcasting the day of the gramophone was over. But the very improvements which were making the loud speaker a joy instead of a distress were being carried into the reproduction of gramophone records. Moreover, the wireless programmes contained some beautiful music that a listener would like to hear again. He could not encore the wireless set, but he could, as a rule, get a record of the piece and play it on his gramophone as often as he wished. Thus the broadcast programme has actually helped the gramophone, so that now it is possible to link the wireless and the gramophone with excellent results.



Minnie seems to have found the way to Mickey Mouse's heart! Those clever screen animals have gained great popularity with film-fans who watch their movements with keen interest and amusement.

SHADOWS THAT MOVE AND SPEAK

We are all interested in cinema shows and curious to know how the miracle of building up such an entertainment is performed. If you examine a strip of film, with the sound markings down its side, you will wonder how it is possible for such a strip of small photographs to spring to life on the screen. How the film actually speaks, clearly and in exact time with the motions of the people on it, is described below in word and picture.

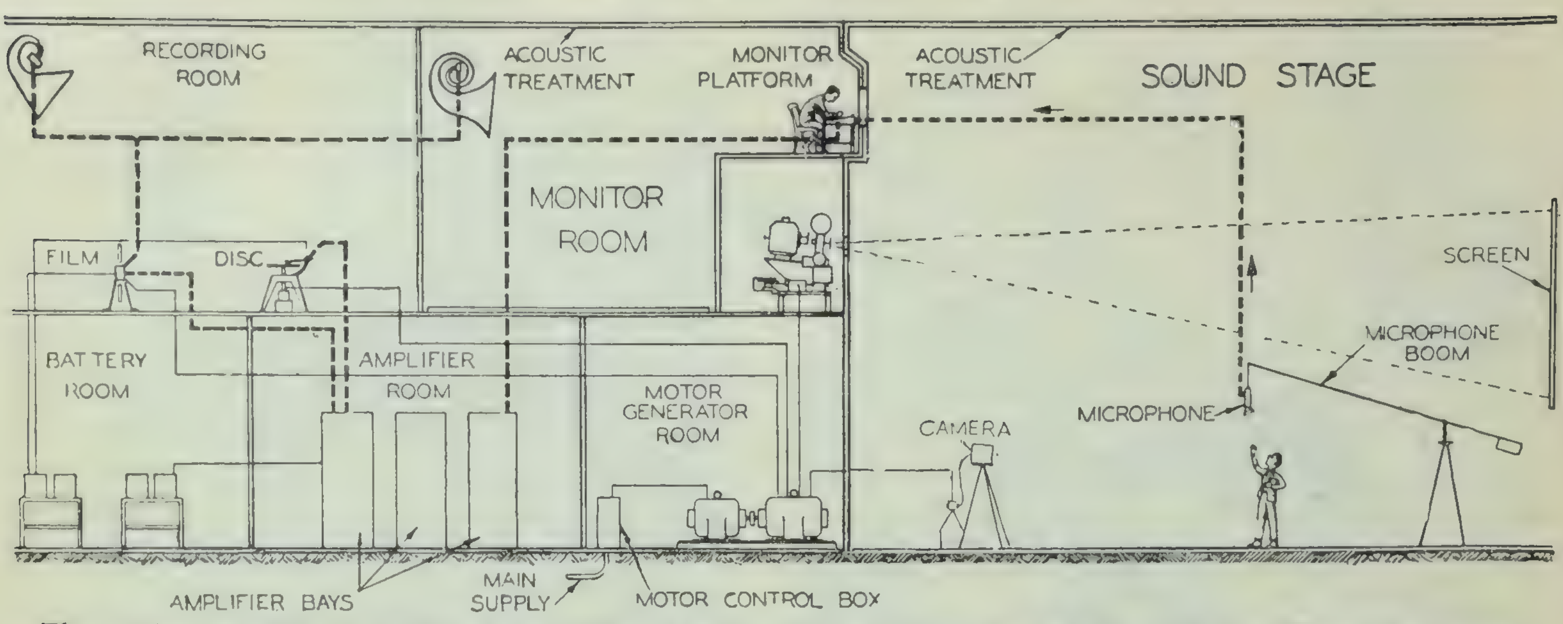
HAVE you ever thought how the wonderful motion and talking pictures of to-day have come about? They are among the most marvellous things men have accomplished within the life-time of the present generation.

All through the ages artists have tried to convey in their pictures the idea of motion, so that whoever saw them might exclaim, "Here are people going on a journey," "Here are dogs in chase of a deer," or "Here is a procession." Explorers are constantly digging into what they believe to be the remains of lost cities, unearthing all kinds of objects, and sometimes they are able to bring to daylight a long hidden room. On the walls of such a room are pictures and often they take the shape of frescoes similar to those we find to-day in great buildings such as churches, museums, schools and similar public buildings. The object of the fresco is often to depict historical events, to keep in mind a scene of the past, just as when going on holidays you will take care to pack your camera in order that you may bring back a picture of something which interested you, something you will want to remember in the days to come.

Sometimes the figures were carved on the walls and this was known as the frieze of a building, though strictly the word frieze was used before there were carvings. Both the fresco and the frieze were used extensively for the purposes already mentioned and we shall not be very far out if we claim these as the first motion pictures, even though they were stationary the succession or sequence of the images conveying the idea of a sequence of events.

In grandfather's day the motion picture had become the Zoetrope—a curious word that, but derived, as so many of our words are derived, from the Greek, *zoe* meaning life and *tropos* a turning. The zoetrope then was an optical instrument used for representing pictures as if they were alive. Even to-day it is possible to buy a zoetrope, though they are not so popular now that the home cinema has come within the reach of many homes.

The first zoetropes had a series of pictures mounted upon a disc in a certain order so that when they were seen through slots in another disc they appeared to be moving; in fact they were moving, since the person holding it turned the rotating shaft.



The modern method of making a sound-film. You can follow it step by step through the different processes.

Photography had not then come along to provide pictures for the zoetrope, therefore artists had to draw a series of sketches, each fitting to the other and similar in action to the now well-known Mickey Mouse drawings—though, of course, much slower. The same idea was at the back of the mind of the artist of a century ago as is in the mind of the motion picture artist who draws to-day: that if the pictures were moved rapidly they would live.

HOW THE FIRST CAMERAS WERE USED IN THE OLD DAYS.

There are two names which are known the world over which were associated with these early experiments—Faraday and Herschel, the latter representing what we may call the optical side of the subject and Faraday the electrical, or perhaps it would be better to say that Faraday was interested on the scientific side. After them came two professors, one a Belgian, the other an Austrian, who, working from entirely different standpoints at first, eventually came to the same result and produced in each case what was really a zoetrope.

About seventy years ago the camera was being greatly improved. An American, named Sellers, a clever engineer, thought that the time had come to have photographs upon the disc of the zoetrope instead of the usual drawings. One day he said to his sons, " Come along, you fellows, we will make a picture of you doing something. What shall it be ? " They thought of several things to do, and at last decided that driving a nail into a box would be as good a task as any for the camera's eye to record. The father worked the camera whilst the boys endeavoured to hit the nail upon the head. It was a slow business, for each photograph had to be made at intervals, as there was no snap-shotting possible in 1860. A man had to stand and count so many seconds between the time he took off the cap and then replaced it, sometimes spoiling the picture by moving the camera when putting the cap on again.

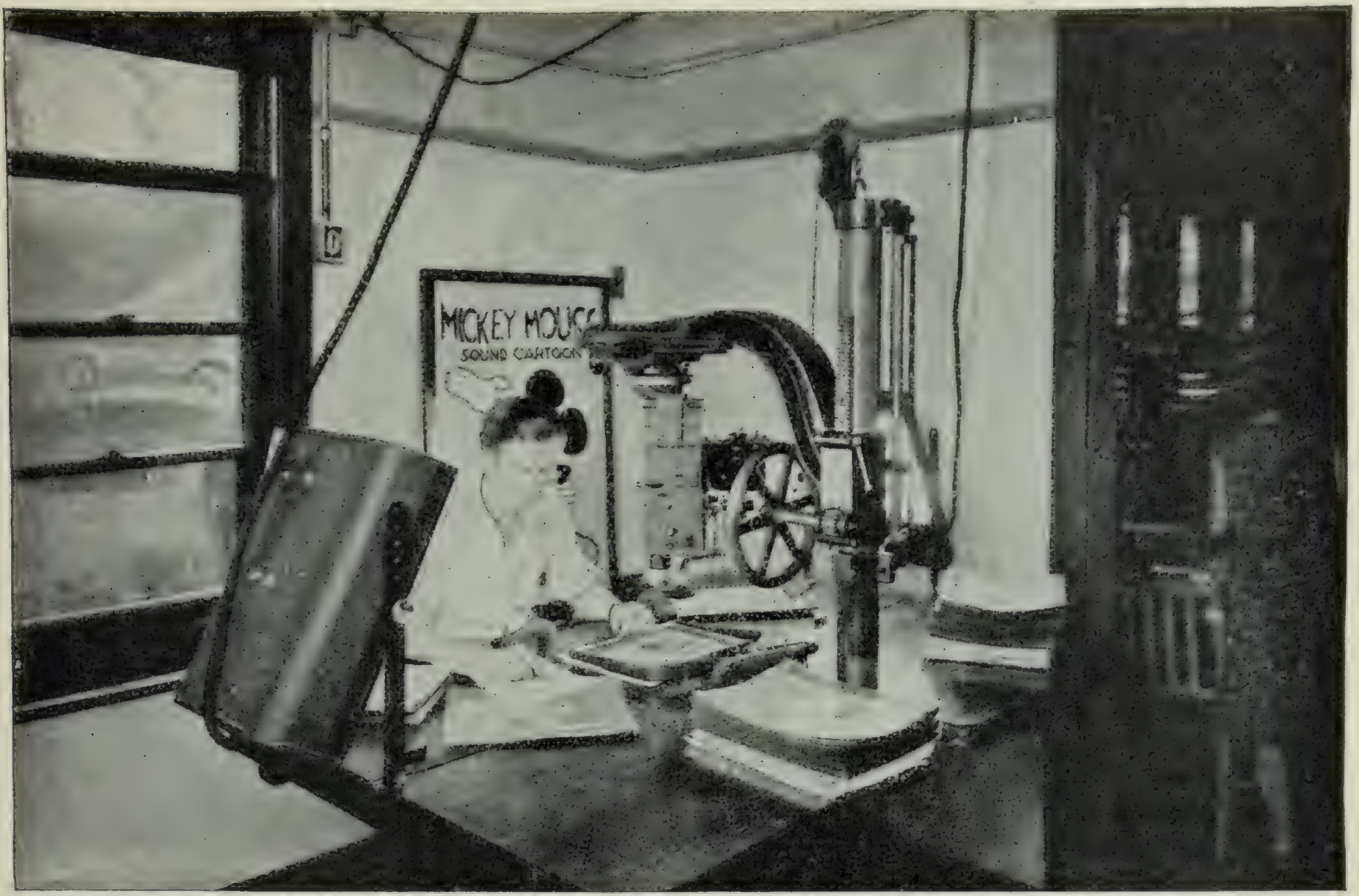
HOW PEOPLE BEGAN TO DISCOVER THAT PICTURES COULD MOVE.

Then came the tedious process of developing the pictures, drying them and sticking them on the blades of a miniature paddle-wheel. When this was revolved a life-like effect was secured, and the motion picture was taken another step up the ladder to the perfection of to-day. This apparatus of Sellers' was patented in 1861 under the name of the kinematoscope. Notice the first portion of that long word, remembering that cinema may now be spelt with a " k " if desired.

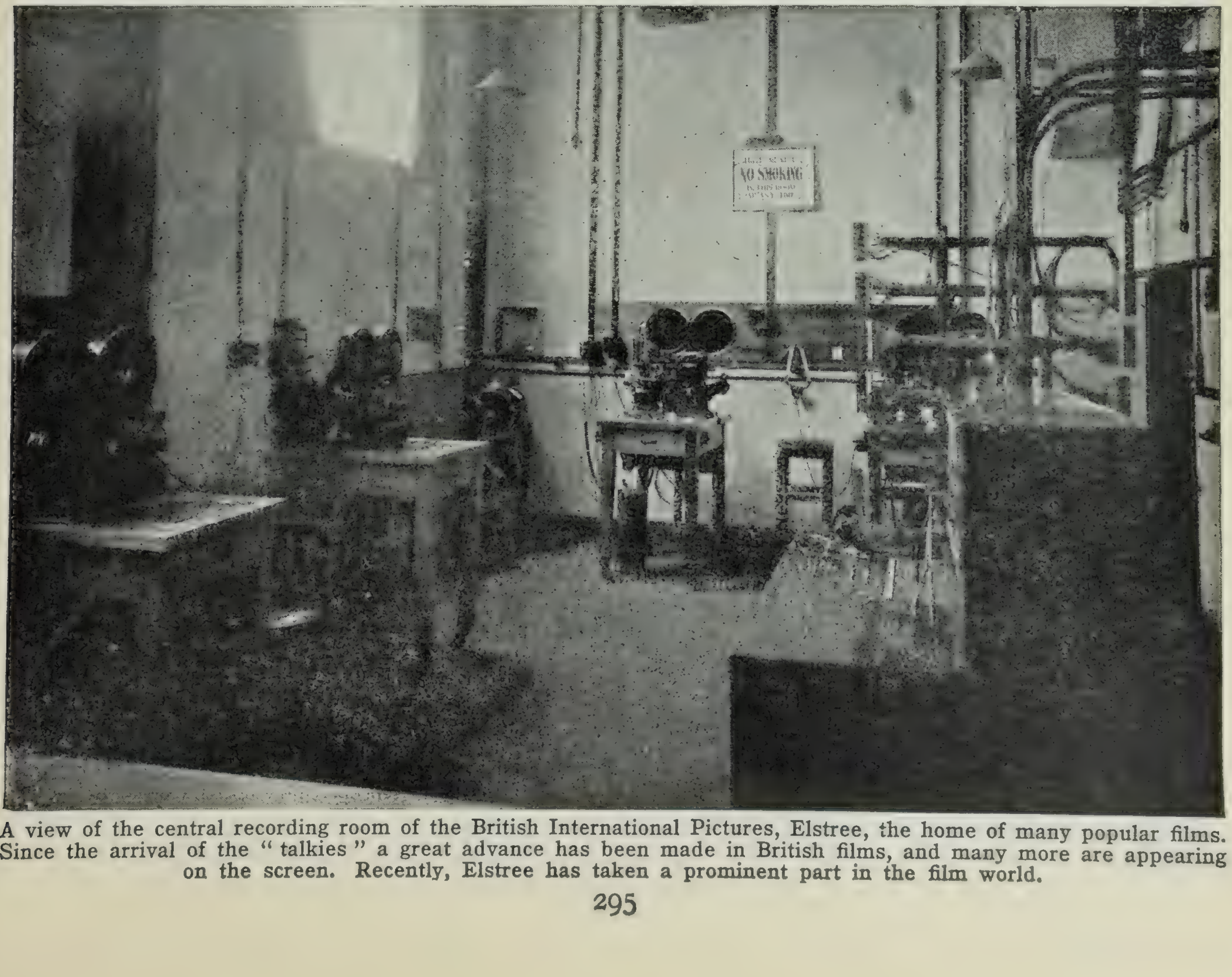
The motion picture was growing from babyhood to childhood now. Improvements came from many sources and one of them was rather curious—the employment of a ratchet and pawl mechanism. This was used in order that the image from each picture as it was turned round should rest for a moment on the screen. It is rather strange that later on the ratchet was discontinued and yet had to be re-discovered for use with the motion picture a quarter of a century later.

The camera was now being rapidly improved, and there were several people who saw that with its increased speed of action the day would soon come when something better than the zoetrope would be brought out. A man wanted to photograph a horse in action, but at this time—about fifty years ago—the plates used in the camera were not fast enough, the shutter mechanism would not allow of the improved plates being used. But when the

MICKEY MOUSE MAKES MILLIONS MERRY



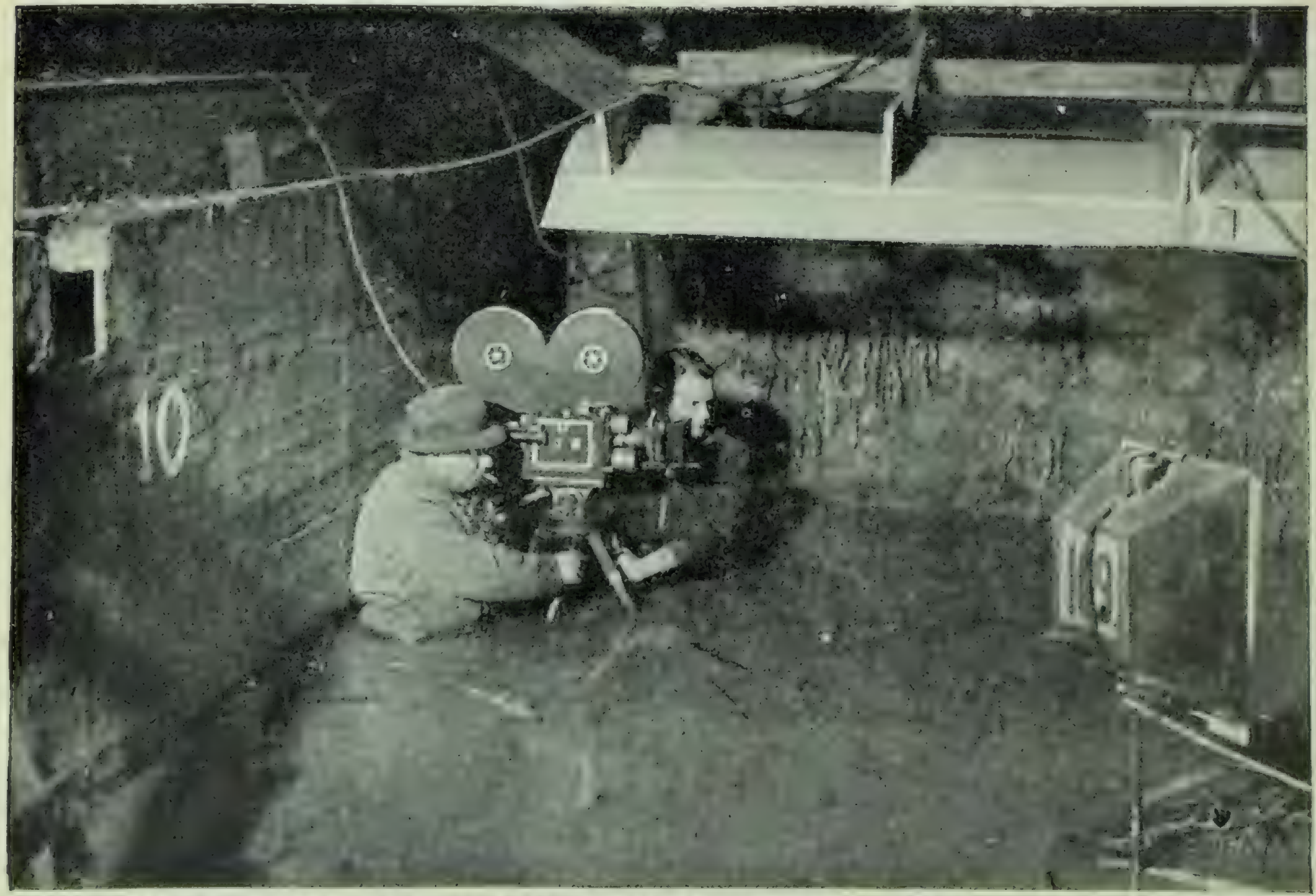
We all enjoy watching the antics of that comic little fellow, Mickey Mouse, who darts about the screen amusing us by his clever nonsense. Do you ever wonder how he came into being and how he is made to go through his many queer adventures? Look in the picture above and you will see a camera man busy at work preparing a Mickey Mouse film.



A view of the central recording room of the British International Pictures, Elstree, the home of many popular films. Since the arrival of the "talkies" a great advance has been made in British films, and many more are appearing on the screen. Recently, Elstree has taken a prominent part in the film world.

BEHIND THE SCENES AT A FILM STUDIO

When you sit back at ease in a comfortable seat in your favourite cinema, do you ever think of the discomforts the film-actors have to undergo before they can provide you with such fascinating entertainment? In this picture we are taken behind the scenes and given a glimpse of the actors at work on a scene representing a riverside palace.



The man with the camera does not always find life a bed of roses—as we can judge from the picture, which shows a scene being "shot" in 10 feet of water. You can imagine the discomfort of such a position! and how difficult it must be to work the camera. Actors, too, face many dangers, so that they can provide us with thrilling films and romantic episodes.

shutter would operate in the tiniest fraction of a second the movement of the horses' legs could be recorded, and fifty years ago saw the first pictures of this type shown upon a screen.

HOW OUR FIRST MOTION PICTURES CAME INTO EXISTENCE.

The motion picture was now like a boy at school—training for the work ahead, but so far not strong enough for such work. It was at the boyhood stage that the great magician who died so recently—Thomas Alva Edison—became interested. He was already busy with his phonograph and it occurred to him that the motion picture could be improved something on the same lines as the sounds were produced from a cylinder. Edison had some tiny photographs made in a strip wound round a cylinder. This was rotated and had to be placed behind a powerful magnifying glass. Quickly the clever inventor found that though the idea might be good his system did not get the best out of the photographs. For a time he laboured in vain ; most men would have given up the project, but Edison was never the man to give in ; the more baffling the problem, the harder he worked at it. After several experiments, which were practically all failures too, he heard that Eastman, a famous maker of cameras and photographic materials, had brought out a film. Hastily Edison sent over to Rochester, New York, for a good strip of the film and tried it with his picture machine. With Eastman's aid Edison had won through, and on the 6th of October, 1889, the first real motion picture as we know it was shown upon the screen.

HOW EDISON LEFT HIS PICTURE MACHINE LYING IDLE FOR THREE YEARS.

It was still a crude affair, with a length of only fifty feet of film, and in thirteen seconds it had run its course. One man called it a peep show, but the inventor said it was a kinetoscope. The film ran through an apparatus which lighted it and magnified it, and although the length of the film has been improved tremendously and the whole practice of making it has advanced, Edison's arrangement for the sprocket holes and the size of the image remain the same.

Now comes a curious story about the first real motion picture machine. In spite of all that it could do and the great improvement upon all efforts which had preceded it, Edison's apparatus lay idle in his laboratory, no one bothering about it. Edison was such a busy man in other directions that it is perhaps not surprising to find that he had no time for his kinetoscope, though someone persuaded him to patent his invention ; this he did in the United States only—a very unwise proceeding really. Fortunately, no one realised how great an invention Edison had made, or it would have been copied by others. For three years the machine lay uncared for, then a man came along and said, " I'm exhibiting your phonograph at the Columbian Exhibition at Chicago. What is this I hear about a picture machine ? Could I have one as a novelty to use to gain more attention for the phonograph ? " Edison said that he could, but there were so many delays in making a new machine that the exhibition had closed its doors before it was finished, and thus a golden chance was lost.

It was not until April, 1894, that the first public appearance of the kinetoscope took place in what was called " a kinetoscope parlour," opened upon the famous Broadway of New York. And that was how the motion picture began its conquest of the world.

HOW THE FIRST FILM ACTORS CALLED THEIR STUDIO "THE BLACK MARIA."

Later we shall note briefly the wonders of Hollywood and other great motion picture centres. How strange to read that the first studio was such a tiny affair that it was built of tarred paper, and that in order to use the camera effectively a revolving stage was made so that the scenes as they were staged could be moved round into the sunlight. The first film actors called the studio " The Black Maria " because it was so much like the prison van in which people were conveyed from gaol to the police court !

If the studio was small, the camera was huge ; it weighed nearly a ton, and so heavy did the operators find it that they would call out for the scene to be brought to the camera, not the camera to the scene. That is where the revolving stage came in !

At this time there was no attempt to put plays on the screen, and except perhaps for Edison, there was no one who ever considered that the actors and actresses would be able to speak and be heard by their audience. People did not take kindly to the first cinemas. How could they when the best that could be offered them was a prize fight, or a couple dancing, or perhaps a scene from a music hall ? Moreover, it was still a peep show. You know the kind of thing ; they are often to be seen on piers at the seaside where you pay a penny and turn the handle. What you

Maurice Chevalier, the popular hero of many musical films.

ready to give the world the continued motion picture, running to many reels and sufficient to fill quite a lengthy programme. Griffith saw that the pictures could be made far more interesting and attractive if such things as fade-outs, close-ups and dissolving features could be introduced, and he set about to accomplish all these additions to cinematography. Instead of reels showing prize fights and meets of the hounds, Griffith concentrated on historic and other plays, employing the best actors and actresses for the purpose. In 1907 Griffith made his great picture, "Ben Hur," in sixteen scenes. It has been done on a much greater scale since, and many of you must have seen it. If only you could have seen the 1907 picture you could judge what great progress has been made.

HOW A FILM ACTOR SPRINGS TO FAME AND BECOMES A "STAR."

WE are so used to reading all about film stars to-day and to following their fortunes, both on the screen and in the newspapers, according them almost royal progresses when they venture to travel, that it will come as a surprise to learn that before the Great War practically every screen actor and actress was unknown. In the first place the producer found it difficult to induce the stage artists to pose before the camera. Some of them saw their profession being taken from them; others felt it was a cheapening of their work. Even those who did agree to act before the camera frequently insisted that their names should not appear in the programme, trusting to their make-up not to be recognised. Again, many of the theatre proprietors would not consent to the actors or actresses working for them appearing in a film; they, too, saw the coming danger of the film. What they saw at a music hall gave them a fair inkling of what the motion picture would be when its greater perfection led to its production of plays.

Although a fine play for the screen takes thousands of pounds to produce, hundreds of copies can be made from the one setting of the play, and these can be earning money for the producers all over the world. On the other hand, the wages of the actors and actresses, the cost of moving from town to town, and the other expenses of what is now often called the legitimate theatre, go on as long as the play is running. If the public support drops

Harold Lloyd, the popular star, who has made millions laugh, in a scene from his film, "Welcome Danger."

" There was an old woman who lived in a shoe." The film from which this picture is taken shows some of her many children, who seem to be enjoying themselves though they are really working very hard, rehearsing.

off soon after the run of a piece has begun the poor theatre proprietor may be ruined. It is rare indeed for the film producer to make a dead loss, because what one country does not care for may be a great draw in another.

HOW FILM STARS BEGAN AT THE FOOT OF THE LADDER AND STRUGGLED TO REACH FAME.

Perhaps the greatest name on the stage within living memory was that of Sarah Bernhardt. Imagine then the consternation amongst the theatrical world when it was known that this splendid actress was not only appearing before the camera, but actually allowing her name to be used. The play was *Queen Elizabeth*, and a very fine queen did the Frenchwoman make. With her coming to the screen the day of the film star began. You know their names to-day. What a magic sound they have—Charlie Chaplin, Mary Pickford, Harold Lloyd and the rest. Each had to begin at the foot of the ladder ; they could not enter at the top as Sarah Bernhardt did. Climbing rung by rung, they attained a height which even the greatest stars of the real stage have never attained, their names known in every household, their fame as secure as human fame can be in this hurrying age. What romance is found in their careers ; what fortunes they have made ! But it is with the apparatus of the motion picture and its development rather than with the personages whose faces we know so well that we are concerned.

The motion picture has broken down every barrier of race, language and custom. Before the days of the talking film all that was necessary was to translate the captions into the language of the country in which the reels were to be shown. Even this was not vitally important, since a well acted picture could convey its story merely by the action and facial movements. Charlie Chaplain was shown everywhere and almost everywhere he was understood and his performance fully enjoyed. Even the Chinese were tickled at this quaint fellow, though of course much of his work was lost upon them. Films of the Wild West were greatly appreciated in France and elsewhere, and in the United States the splendid art of the Italian producer was greatly admired. Yet there were difficulties encountered as the development went ahead. As a rule it was the film play that caused these difficulties. Once, in a country of mixed races, there was a fight in a cinema over the subject dealt with in the film.

HOW FRANCE LOST HER LEADING POSITION IN THE FILM WORLD.

We all know that the majority of the motion pictures come from America. Have you ever thought why this should be so, especially when France had so much to do with the perfection of the film ? The tragedy of the Great War came just when every country was trying to produce motion pictures which should do credit to its producers. France, Germany, Italy and many other countries had to leave the development of the pictures to the nations who were free from the distractions of war. Then came the settling down after the great struggle. This took time and allowed Hollywood to retain its leading position.

Colour pictures have arrived, but they are not numerous as yet, as there are great difficulties in the way; but there are some who think that this will be the next great development in picture making and that all will be of this type in the years to come.

HOW THE PRODUCER CAPTURES THE WORLD AND MAKES IT FLICKER BEFORE YOU ON THE SCREEN.

Perhaps the most fascinating feature of the screen are the tricks which the camera is encouraged to play, coupled with the tricks which the producer is allowed to attempt. Have you seen a rose unfold petal by petal? That is one of the achievements of the motion picture artist, and it is especially interesting when the colour process is employed. Then a building will be demolished stone by stone in a remarkably short time; a horse made to gallop at a furious rate by accelerating the pace at which the film is sent through. The horses in one well known picture were shown galloping at a tremendous pace down a steep hillside. This was filmed at a spot not far from London upon the Portsmouth Road. The horses and their riders came from some city mews and a number of the former had spent their lives in the shafts of milk floats. The hillside is not at all steep and the pace at which the horses descended was not at all rapid. But the camera man saw to that. It is also possible to slow up a process and show something which would be too quick for the naked eye. These pictures are known as "slow-motion" films.

Another use has been to photograph major surgical operations and then show these on the screen for the benefit of students who are living miles—perhaps thousands of miles—from an important hospital where the greatest of surgeons do their splendid work.

WHEN PICTURE FILMS WERE MADE OUT OF DOORS IN THE SUNLIGHT.

In the earliest days of picture-making strong sunlight and the open air were considered first essentials. California, still the home of a very large number of motion pictures, was in a strong position for sunlight, since it is very fortunate in the number of sunny days, whilst Britain was unfortunate in this respect. As time went on it was found that the pictures must be recorded throughout the year, sunlight or no sunlight; moreover, there were many scenes to be filmed of interiors. The play took place indoors more frequently than out-of-doors. What was to be done? There was only one thing for it—artificial sunlight—and now came the greatest step forward because time and season no longer mattered.

It has frequently happened that a film play has been written—possibly adapted from a book or a stage play—and the designer of the background has been given a fortnight in which to do his part. But he knows quite well that he will have the help of the camera, and the eye of this useful magician will do some remarkable things if asked. Thus, a pillar of cardboard will be built up to a height say of ten feet. A word to the photographer and it may be thrown on the screen as a great towering affair against which the man photographed in the foreground will appear as a pygmy. Of course it is often possible to use an existing building. When Ivanhoe was filmed Chepstow Castle suited the producer better than anything he could have hoped to erect from papier-mache. There is a small disused church on the outskirts of London which was so often used as a background for weddings that a notice had been put up forbidding film producers to photograph it.

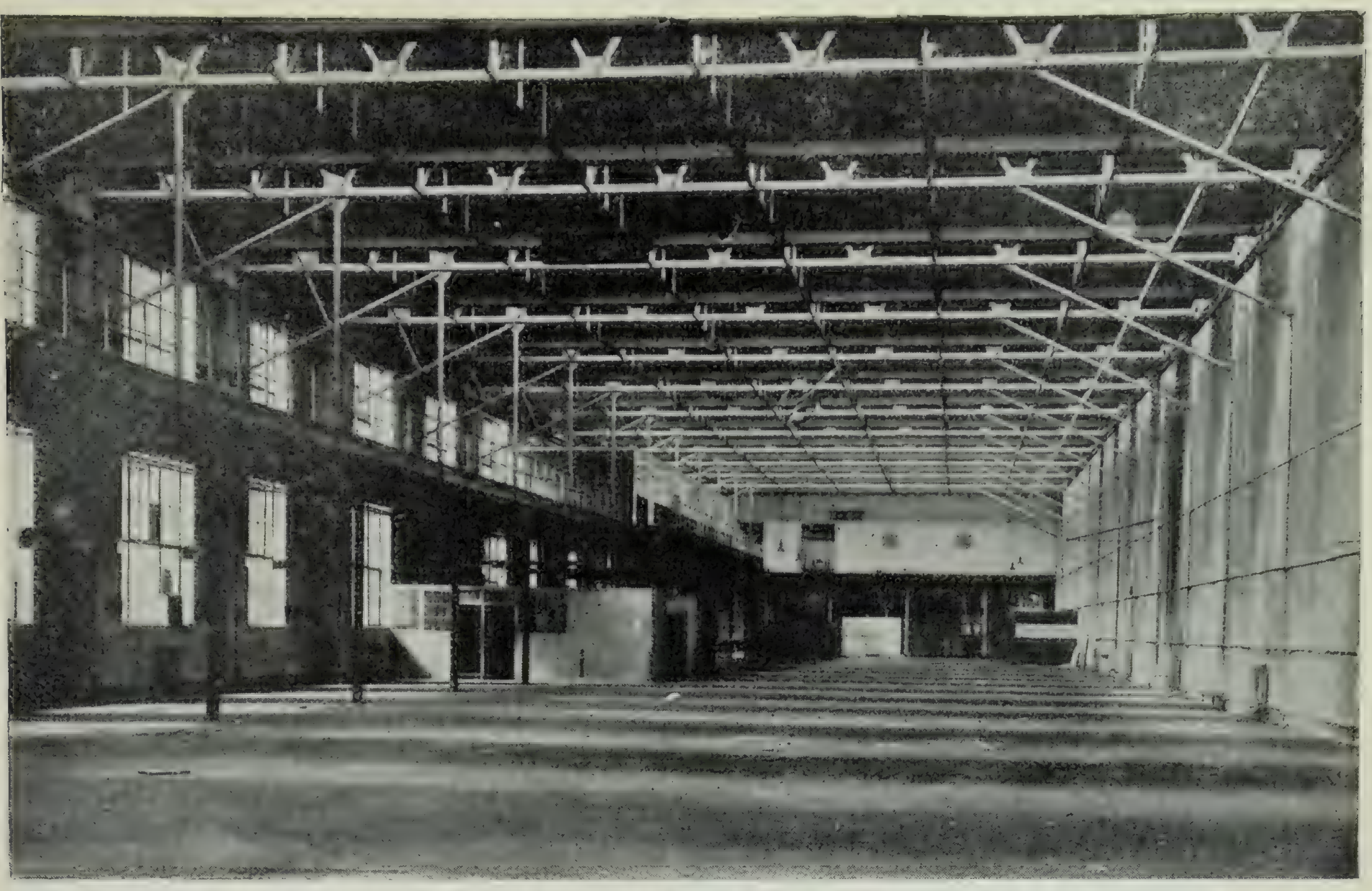
HOW THE MAN WITH THE CAMERA "SHOOTS" A FILM SCENE.

Huge studios have been erected and under their roofs some surprising sets—as they are called—are built up. A room for the film producer will be quite satisfactory if it has only three sides. The walls may be of three-ply wood or papier-mache, but in other respects, such as furniture and pictures, every care is taken to have the real articles and so get as realistic an effect as possible. Behind the camera will be the whole company getting ready for the next scene, but before the camera there must be nothing save the actual set which will appear on the reel. The greatest problem is that of the lighting engineer, who must be certain that his equipment will give just the right effect. Many a scene has had to be re-staged for a further "shoot" because the lighting was not quite what the producer needed for the full effect of this section of the play.

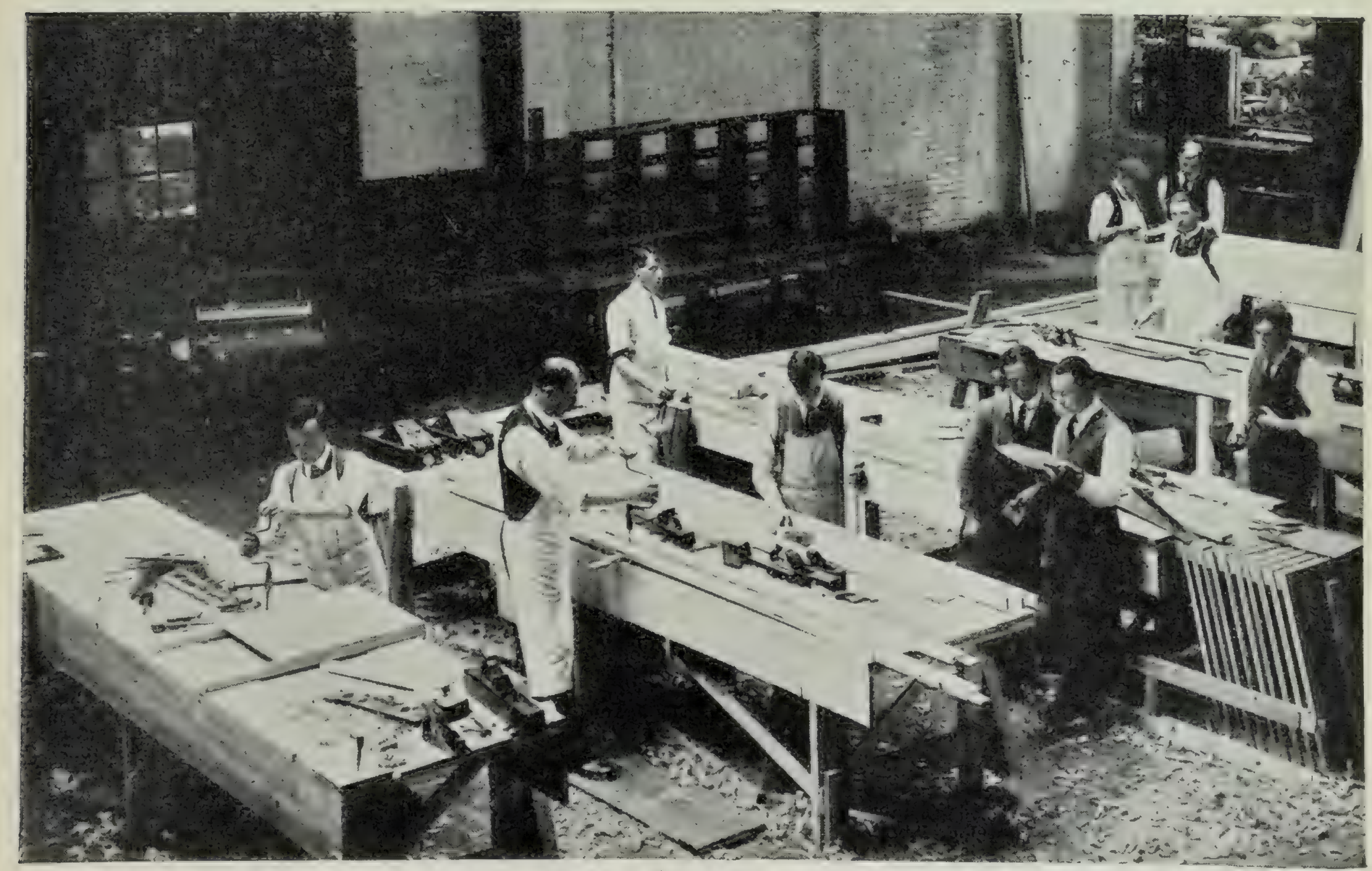
It is sometimes possible to get the proper effect in a picture by disregarding the background and concentrating upon the characters. There is one background that would be familiar to many a cinema-goer were it not that the scene played in front of it is so absorbing. A kilted Scotsman walking in front of this background proclaims that the scene is north of the Tweed; but the same wall

SOME STUDIO SCENES FOR FILM-FANS

HOW FILMS COME TO LIFE

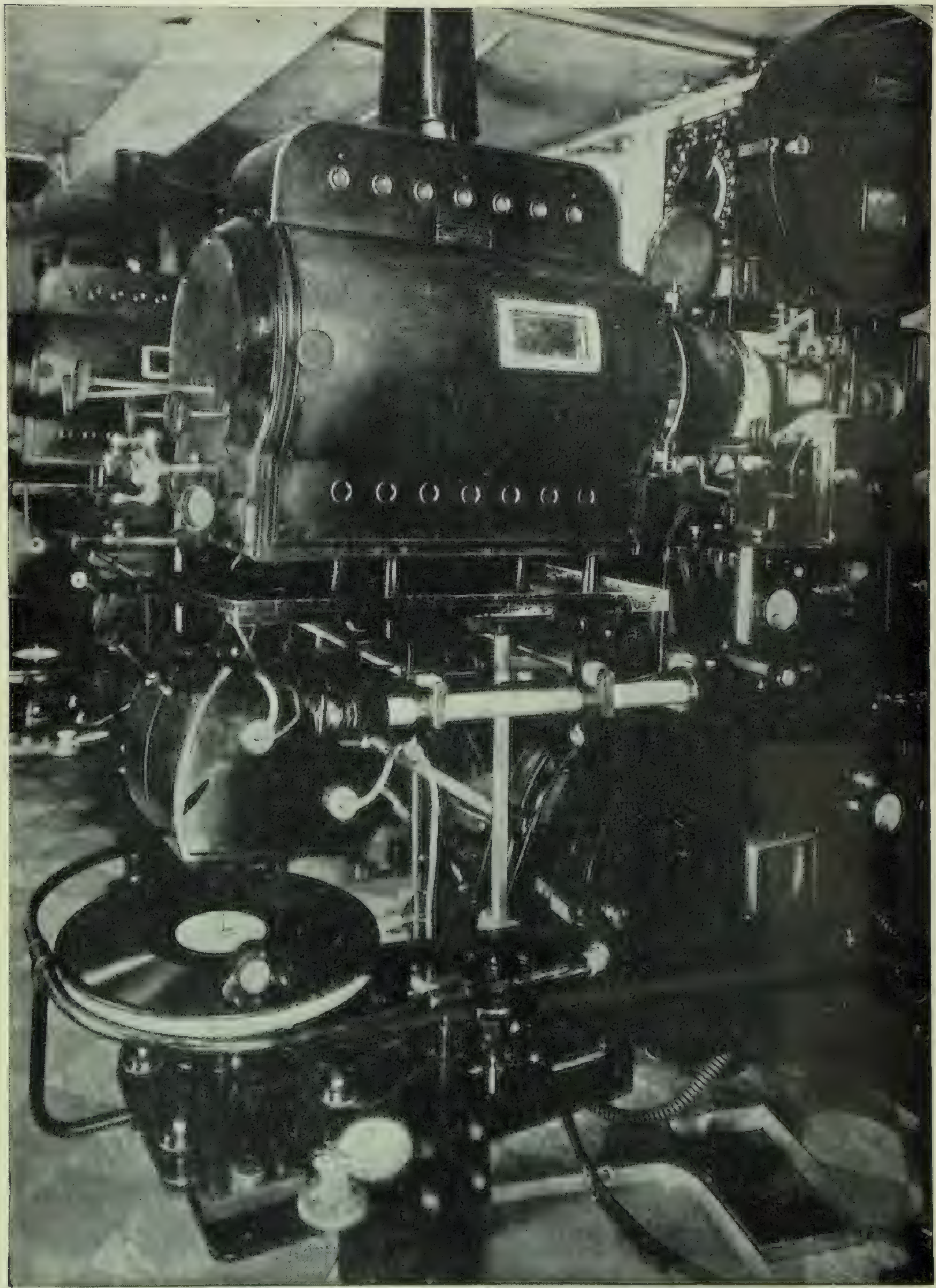


Film-actors have to spend long hours in the studio rehearsing their scenes until they are perfect. In the old days this was both tedious and unhealthy, but modern studios are larger and conditions much better. Imagine how many thrilling episodes this vast studio has witnessed and how many actors have sprung to stardom within its walls!



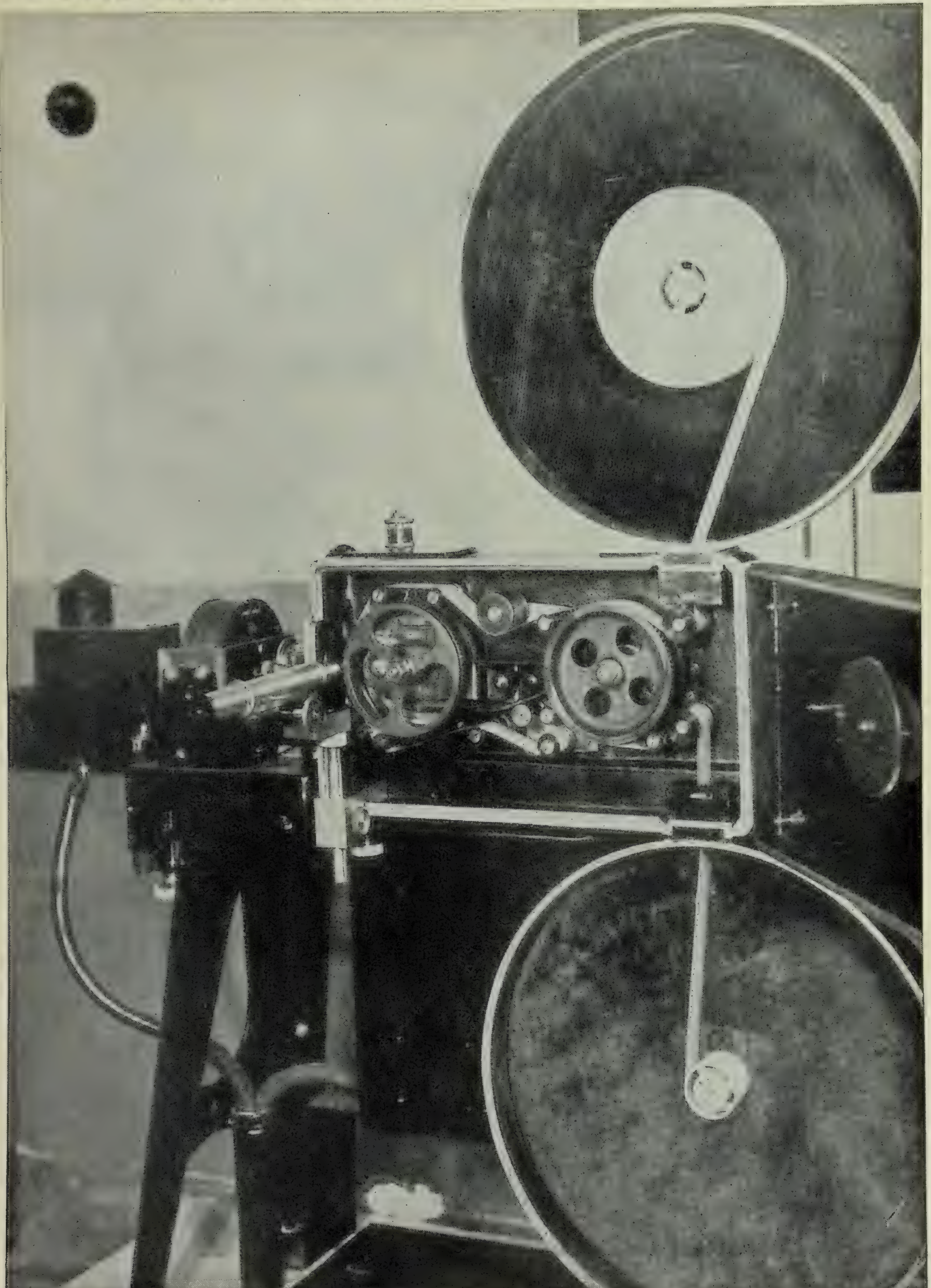
It is not only the film-actors who work hard behind the scenes to provide us with amusement when we visit the cinema. Every studio is equipped with a workroom where men are busy making "property" for the scenes which are to be filmed. Furniture has to be made—even places constructed, so that the films will look more realistic.

HOW BUSY MACHINERY MAKES SOUND FILMS



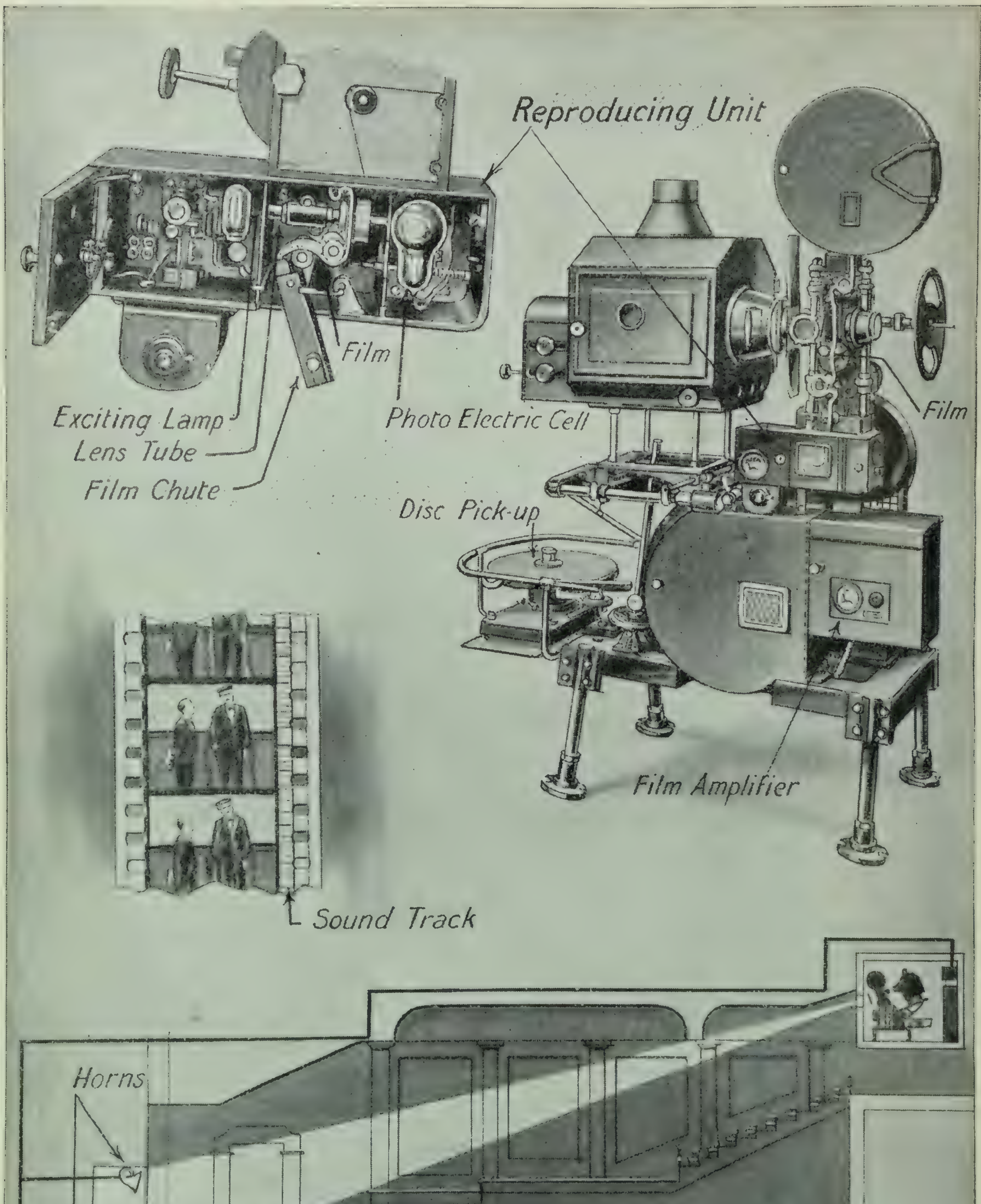
Sound is wedded to the picture by means of this huge projection apparatus. The electric pick-up, seen in the bottom left-hand corner of the picture, gathers music from the record, and this, amplified, makes the picture "talk." The sound is synchronised or fitted to the actions of the players.

SOUND AND MOVEMENT CAUGHT BY MACHINE



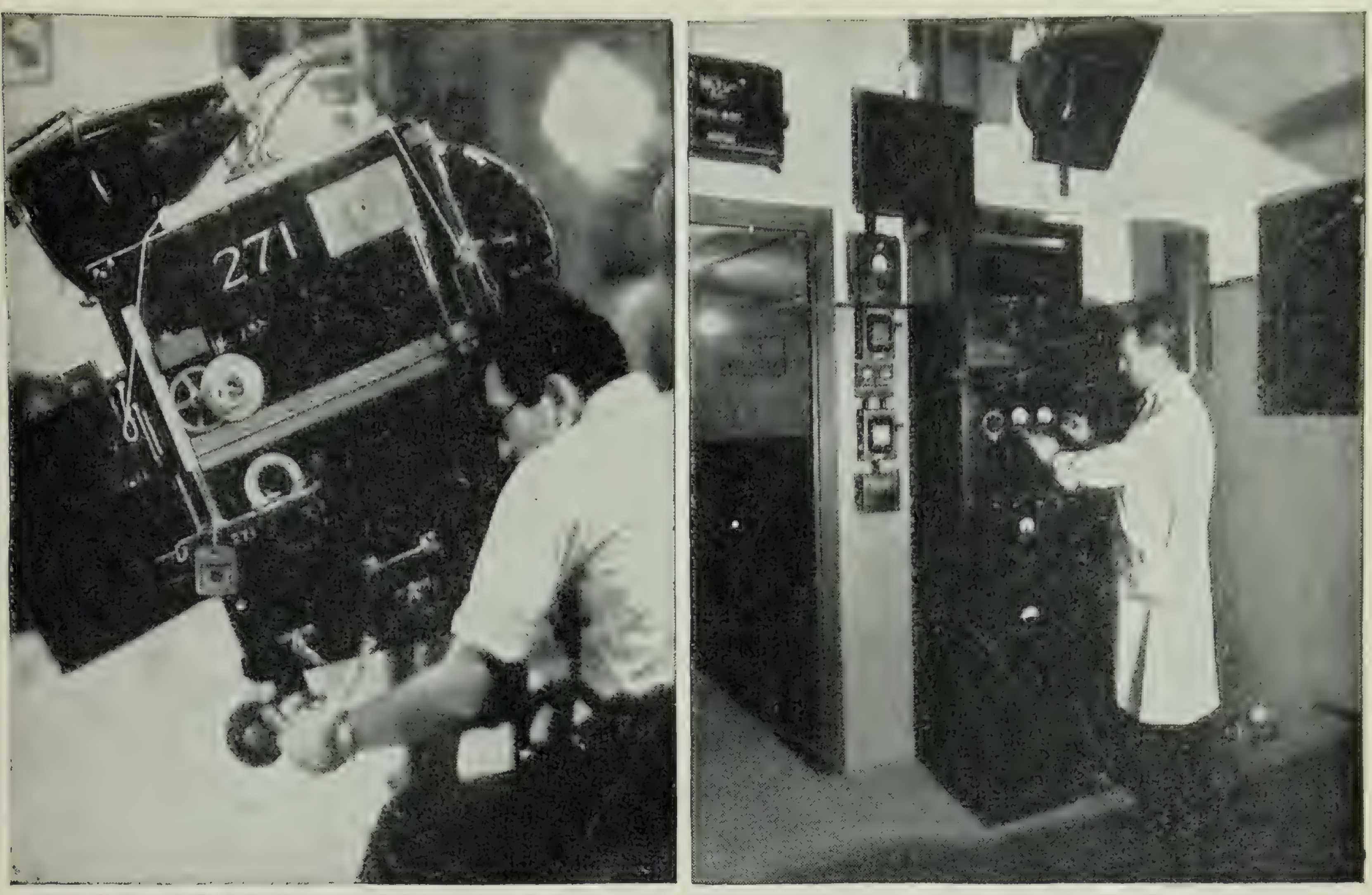
The mechanical giant which records the words of film stars and captures their movements at the same time. It is a film recorder, driven by a small motor. Note how the film is fed from one reel to another.

FLICKERING SHADOWS THAT MOVE AND SPEAK


Reproducing Unit
Film
Exciting Lamp
Lens Tube
Film Chute
Photo Electric Cell
Film
Disc Pick-up
Film Amplifier
Sound Track
Horns
Screen

The above drawings show you how the picture is seen and the words heard in a talking-picture theatre. The sound track runs along one edge of the film and the sounds are reproduced by means of the reproducing unit with photo-electric cell. They are then amplified—or made louder—and travel to loud speakers hidden behind the screen. The sound is timed to fit the action in the picture, and so we witness and hear what seems to be a real set of incidents.

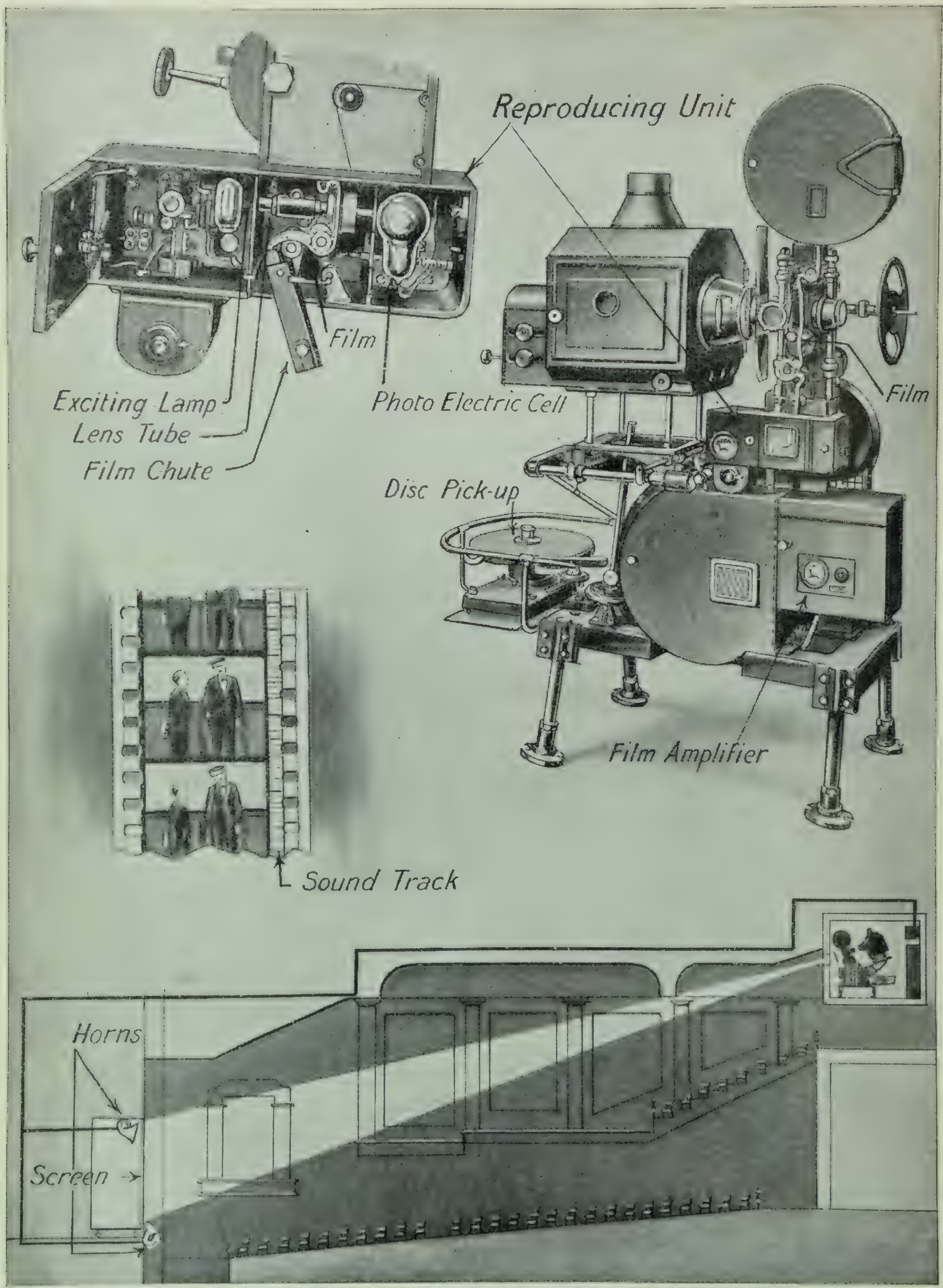
HOW FILMS BRING SOUND TO THE CINEMA



The great camera used when making a sound-film. You can imagine how difficult it is to manipulate. The amplification rack on the right shows where sound is regulated, so that the "talkie" can be brought to the correct pitch and tone.

What a complicated machine is the disc recorder! There are many adjusting screws, so that the track of the needle may be regulated with accuracy. The operator watches the recording through a magnifying glass on the machine.

FLICKERING SHADOWS THAT MOVE AND SPEAK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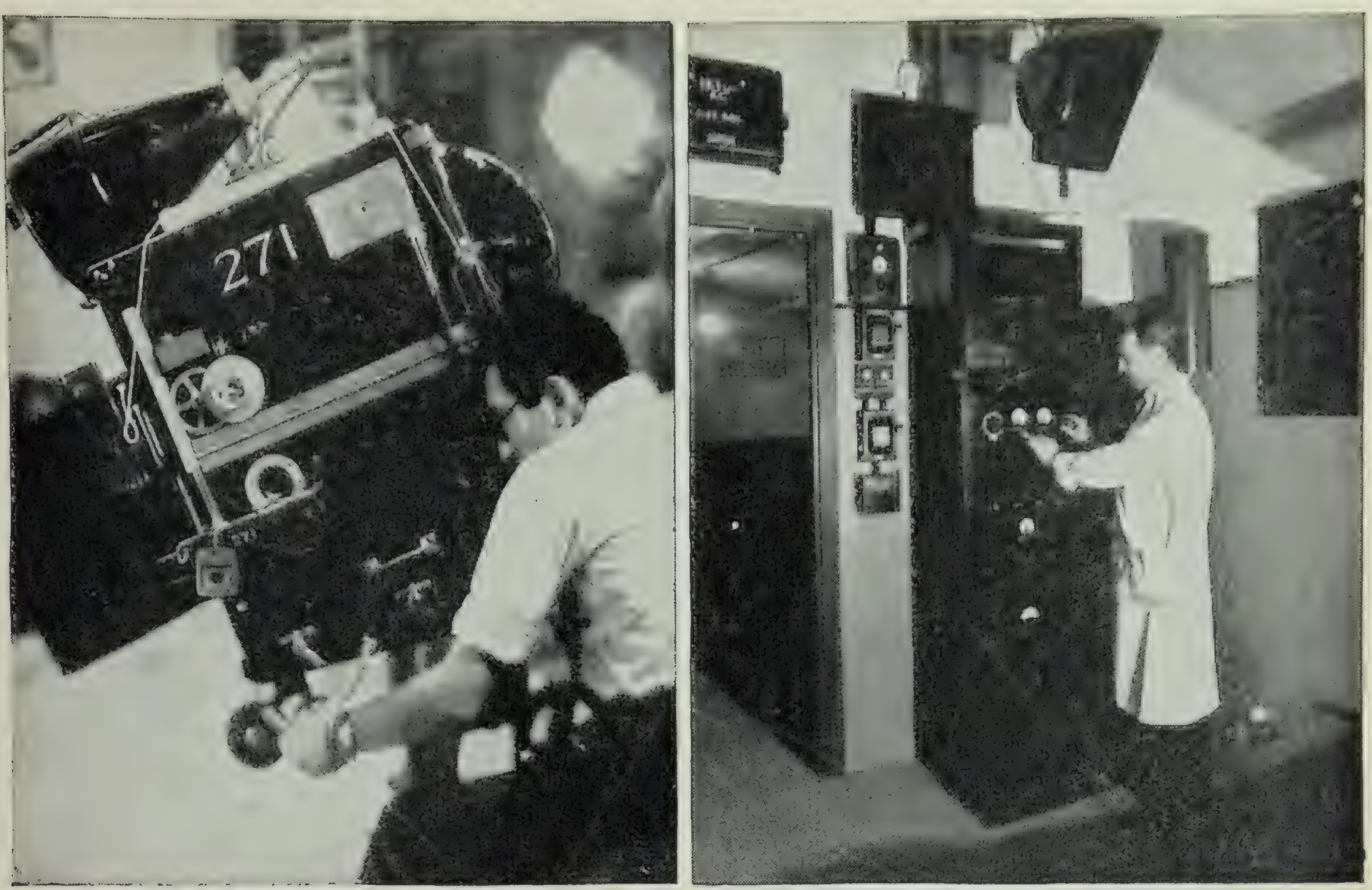

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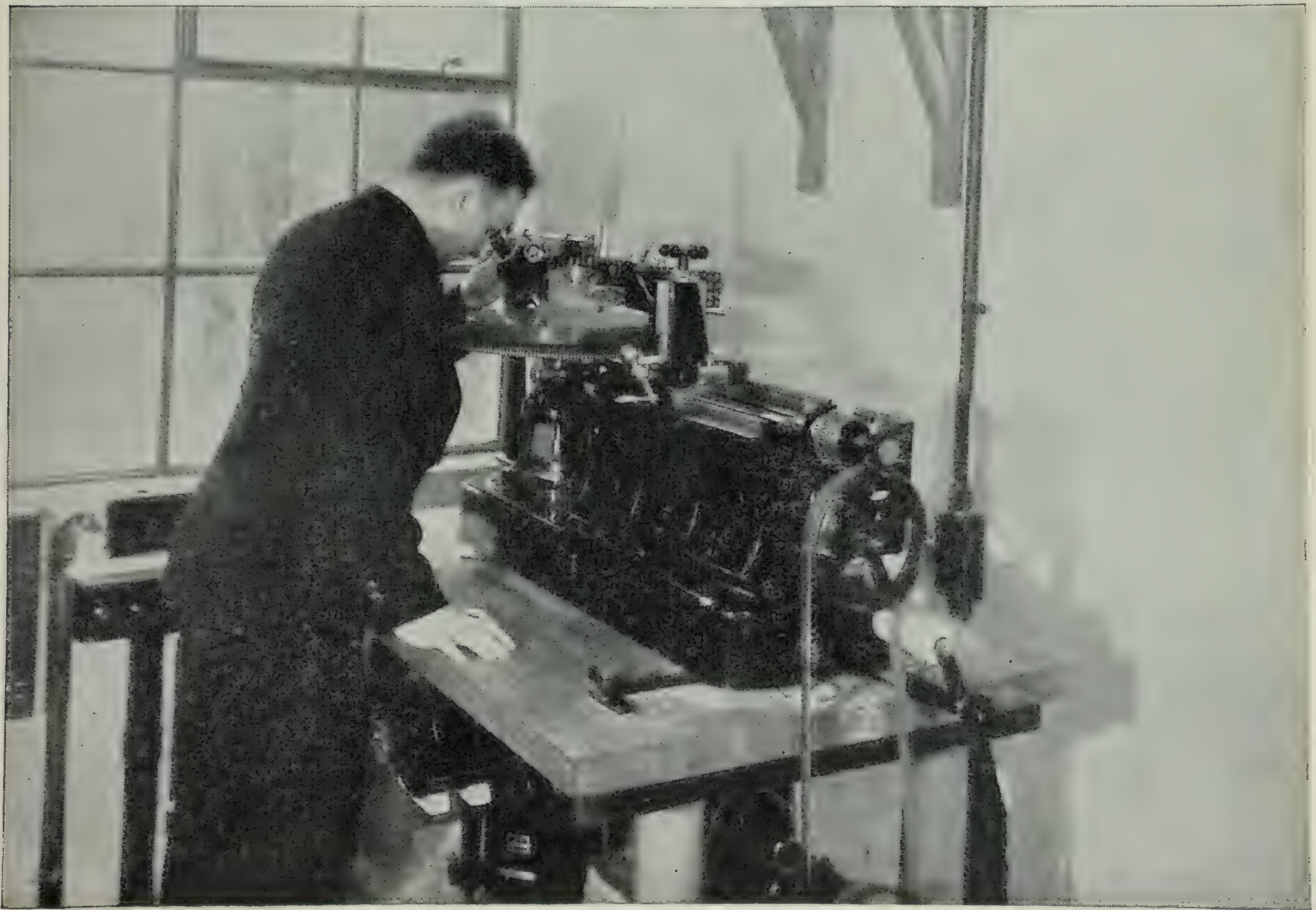

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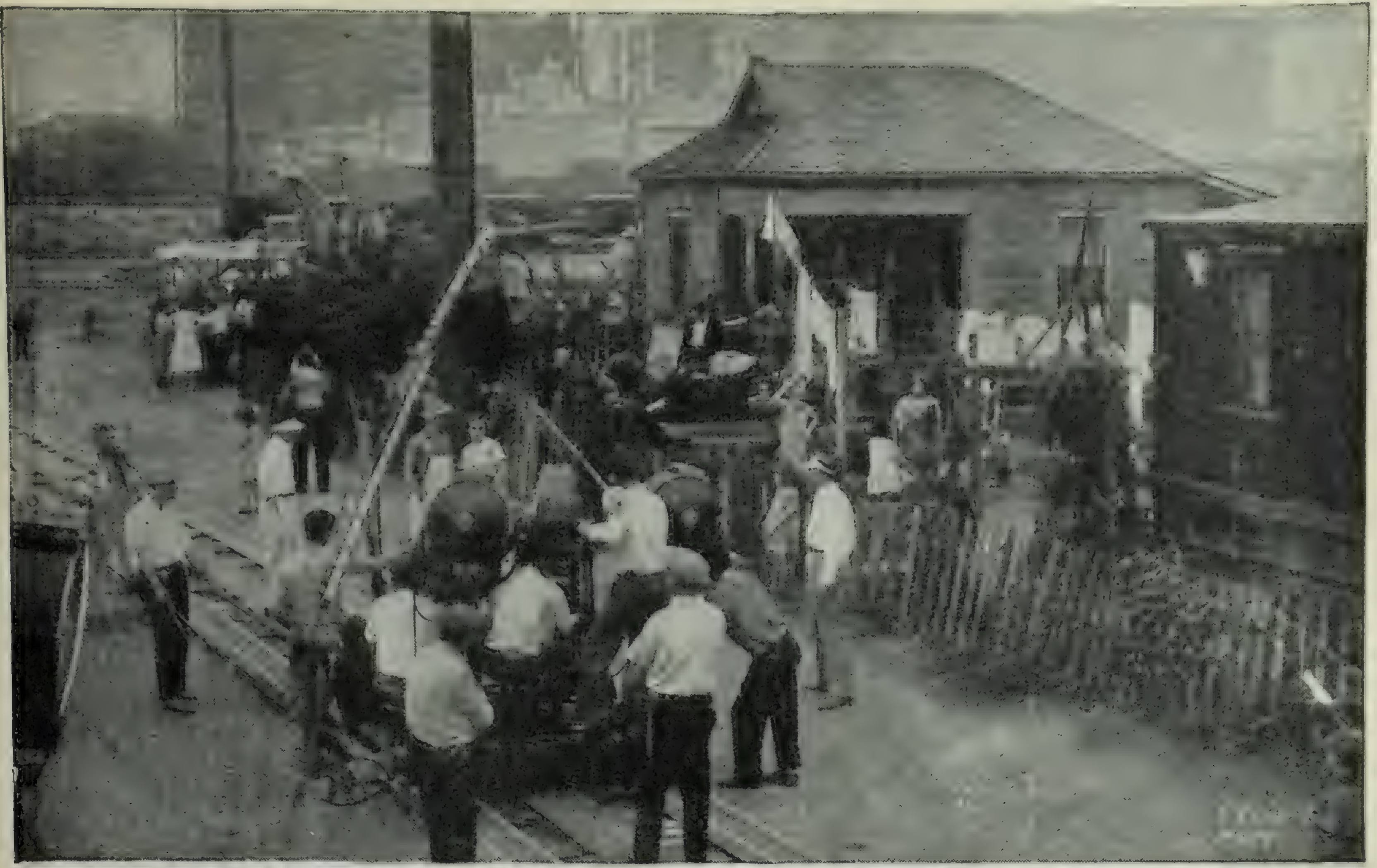
"SHOOTING" FILMS BY DAY AND BY NIGHT

Two well-known film-stars are here seen taking part in a "shot" for a new film. Some idea of the wonderful weather may be gathered from the dress of the cinema operators. The scene is being taken near midday. Notice how short are the shadows.

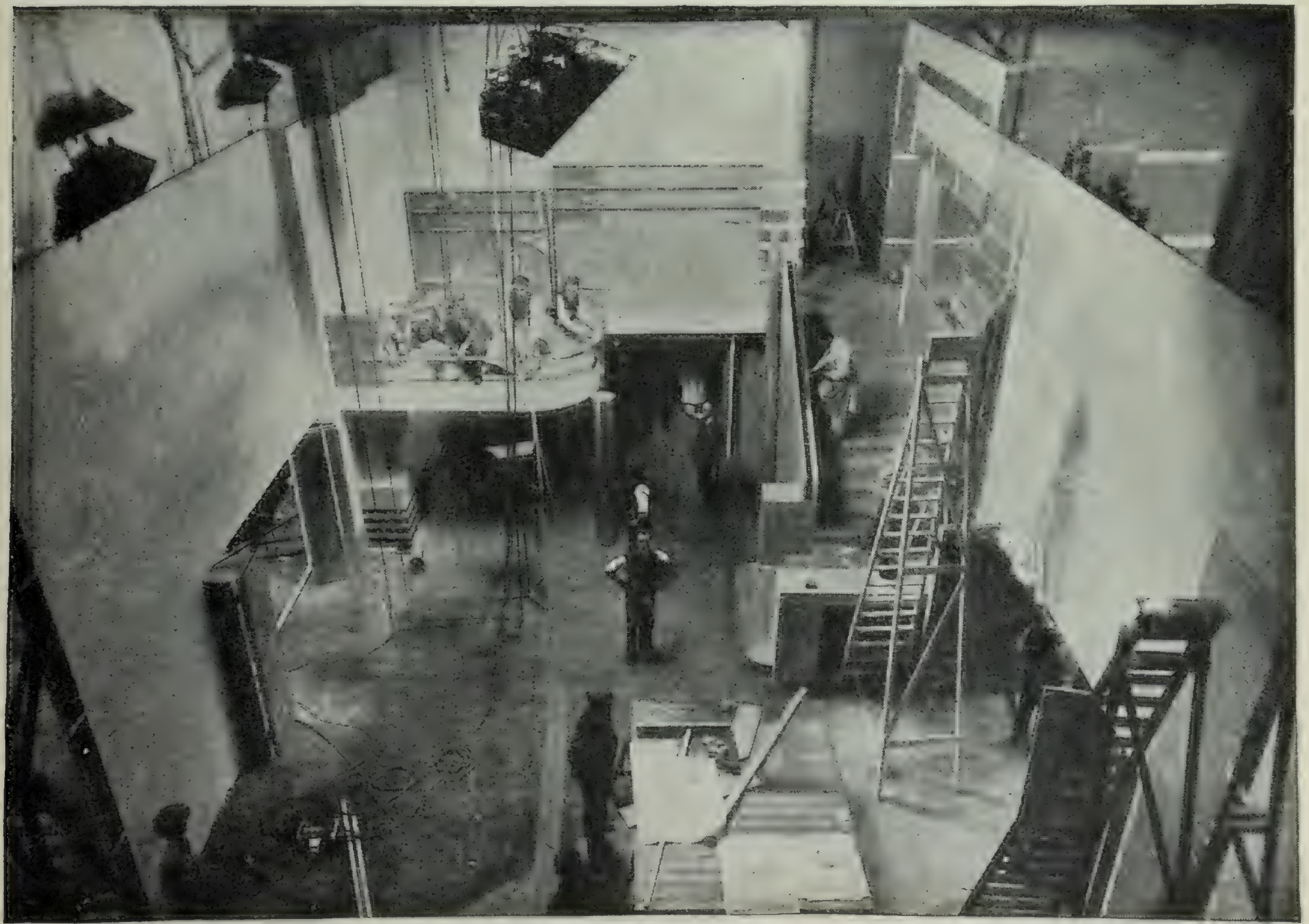
SMALLFORD
MELLINGHAM

How is a "talkie" made at night? A scene is being taken in the dark of a station which has been specially built for the occasion. Note how crude the building is, and how the roof which is not to be shown in the film is left incomplete.

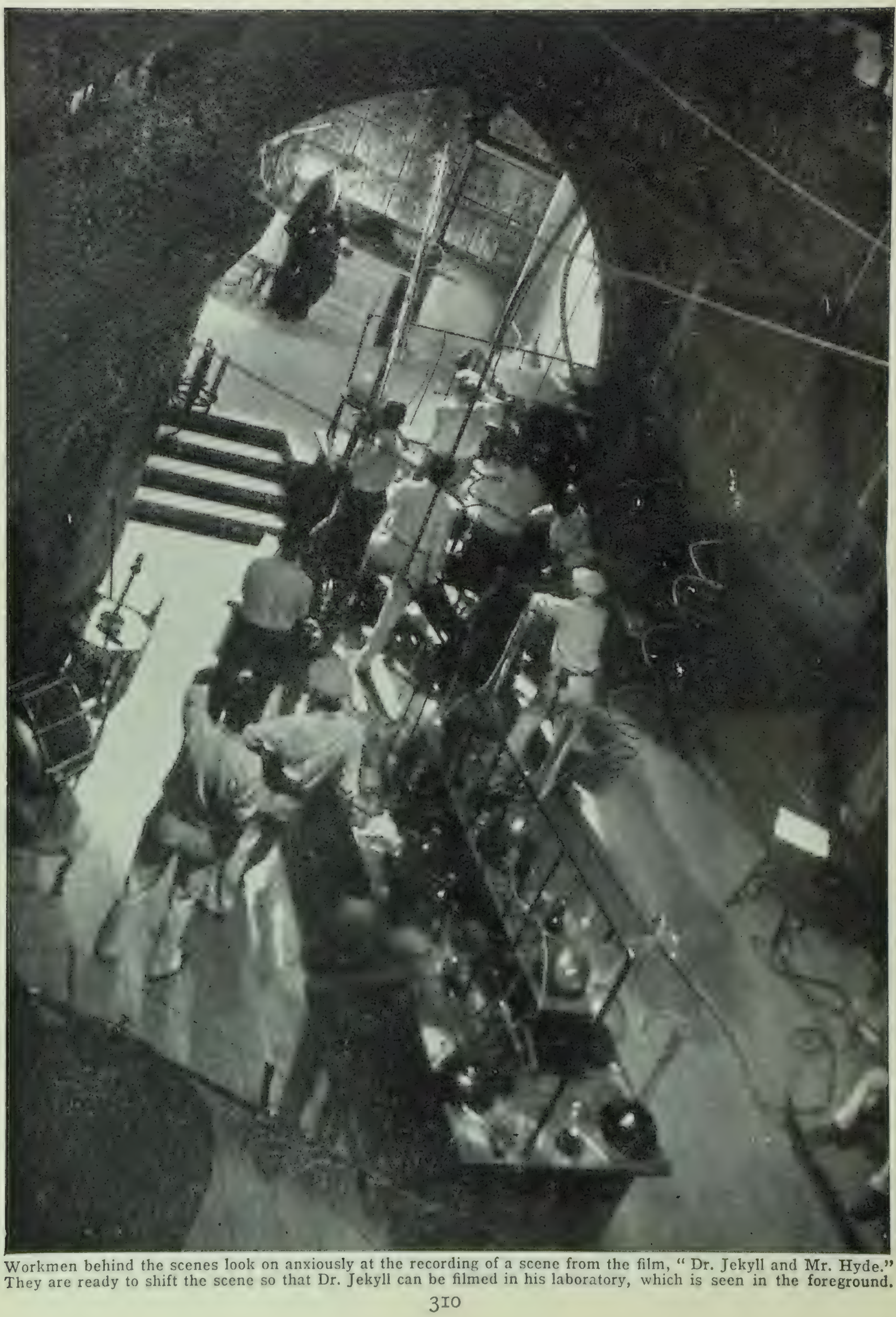
SOME OUTDOOR AND INDOOR SCENES



Down our alley! Well-known actors are here seen at work in a scene showing life in the slums. The " stage " has been set in order to emphasise every detail of the surroundings, for the "location" of a film must look natural.



Let's look down on a scene in the making. Carpenters are busy fitting up the studio to represent a modern hall with stairs leading from it. Afterwards, the producer and film-stars will rehearse in the fitted " stage."



Workmen behind the scenes look on anxiously at the recording of a scene from the film, " Dr. Jekyll and Mr. Hyde." They are ready to shift the scene so that Dr. Jekyll can be filmed in his laboratory, which is seen in the foreground.

has been thought, in another film, to be a very fine specimen of a Spanish castle, because the dress of the actors was that which we associate with those visiting a bull-fight.

HOW "A LITTLE BIT OF EVERYTHING" FINDS ITS WAY INTO THE STUDIO.

The designer of exteriors and interiors is frequently set a difficult task. One week he will be asked for the interior of an Eskimo igloo; the next for the engine-room of a monster liner. The latter is not so difficult because he can get a picture from any of the steamship companies, but how would he find out exactly what the Eskimo's hut was like? He might, of course, come across a picture in a book and that would be his guide. Even this would mean some research and he might not find what he needed. If he failed to find a picture he would have to do the best he could, possibly feeling at ease in the thought that few who saw the finished picture would have been inside an igloo. The larger studios have special departments to look after the properties—using this word in the sense that it is used in the theatre. A tour of the property rooms is an education in itself. There is a huge room where there are racks upon racks of footwear—of all shapes and sizes and of all kinds—from the dainty little ballet slipper to the high boots used in Cromwell's days. In the wardrobes hundreds of dresses are placed and kept already aired for any demand. It would never do to scrap the dresses used for a historical motion picture; quite easily they can be used again for a modern film where the actors have to appear in costume at a cabaret or fancy dress ball.

HOW ANIMAL ACTORS ARE HOUSED IN THE ZOO STUDIO.

Animals and reptiles will have to be housed within easy reach of the studios, and these must be kept in healthy condition. In one film shown recently there was a most interesting duel between a snake and a mongoose. Though it looked as if it took place in the desert it was actually staged on a large table in the studio, the background being formed from various properties already on hand, the snake coming from the studio zoo. The mongoose was hired for the occasion.

A staff of skilled needle-women is established at the back of the women's wardrobe and at a minute's notice they can begin on any dress or the alteration of existing wear. If this were not provided many a scene would be held up.

Nothing is left to chance and the actors and actresses must put in a great deal of work before the scene is "shot." And often when the film has been developed there will be sections of it—or even the whole reel—which do not please the producer. The higher his reputation the more care will he take in the filming of his picture plays. Until the sound picture came along the actors and actresses employed from the regular stage had to learn afresh. In the theatre the players convey the play more by their words than their actions; in the silent picture it was the facial expression and the rapid movement that mattered. Imagine then how often the screen players would have to repeat either part or the whole of their performance, and how the temporary lapse of one would spoil the balance of the whole reel.

HOW ACTORS CAN CHANGE THEIR APPEARANCE BY SKILFUL MAKE-UP.

Steadily the film actors and actresses have learned that by wise make-up and careful use of eyes, mouth and limbs they can convey all that it is necessary to convey, and this will explain why, in some instances, the greatest artists of the silent film have not been so successful with the sound picture. In the former they had to get the play "across" with their actions, aided now and then by a few words thrown upon the screen. They grew up to this and had never been on the stage, where everything depended upon clear enunciation and the use of a gesture with certain words. Now that the talking picture is making such wonderful progress, it is perhaps not surprising that the film producers are looking more and more to the regular stage and endeavouring to take successful plays from the legitimate theatre with the same actors and actresses taking their original parts. These players are tempted across the Atlantic and they draw a greater salary for a few weeks' work upon a sound picture than upon a long tour with the play itself.

Right from the beginning of the motion picture there were prophets who said that the day would come when the moving picture on the screen would talk—or at least appear to talk. But there were some tremendous difficulties in the way. Edison's phonograph, which recorded the speech or music in a room, was the basis upon which the sound picture has been built up. The business of the engineer was to time or *synchronise* the putting over of the speech with the accurate movement of the picture. Nothing would be worse than that the actor should be speaking through the sound producing machinery when on the screen his lips were sealed and he was obviously doing something else. For a number of years experimenters had to wrestle with this problem. It is of great interest to learn that Thomas Alva Edison, when he invented his talking machine, was anxious, even so long ago, to have pictures that would go with the sound. He lived to see the sound brought to the picture, though he had visualised the picture being brought to the sound apparatus instead.

HOW SOUNDS ARE CAPTURED AND MAGNIFIED FOR THE CINEMA.

Another obstacle in the way of linking sound with the picture was the difficulty of amplifying the sounds. Remembering that the voice of the actor must carry throughout the whole of a large theatre as easily as the picture may be seen, it will be clear that the engineer was faced with a problem. That splendid friend of man, electricity, was waiting for an invitation to assist the engineer. The tremendous development of wireless, with the constant improvement of the microphone and the electrical recording of gramophone records, all helped towards the perfection of the sound film.

There are two methods employed in producing a sound film, one by using a gramophone record which must synchronise with the picture being shown, the other having the sound record upon the film itself. With the latter method several systems are employed, all involving a good deal of careful work on the part of the producers. If you examine a gramophone record you will notice that the louder passages in the music have a deeper scoring on the record ; in the sound film this effect is obtained by the varying density of the developed silver deposit.

THE WONDERFUL TOOTHED COMB WHICH PICKS UP SOUND.

It would take a great deal of space to describe all that happens in the making of a sound film, and there are so many technical terms employed that it would prove rather wearisome for you. Perhaps a general description, which will convey something of the processes involved, may be worth while.

It was only in 1926 that the vitaphone was first introduced. This was the beginning of the disc method of reproducing the sound for synchronising with the motion of the actor. This disc is made much in the same manner as a gramophone record, which it resembles. It is then attached to the projector in such a way that the actions of the characters and their speech are seen and heard at the same time, the sound being transmitted through a loud speaker by means of an electrical circuit. There is other elaborate mechanism but that is the main idea—the sound disc operated by the projector.

Photographs of the recording and projecting machines will be found in these pages.

The other method is still more wonderful, as here the sound is recorded along the edge of the film by photographic means already mentioned. The strip is only about a tenth of an inch wide and we might think of a small-toothed comb as the photographic reproduction of the sound. Instead of real teeth these are picture ones, which vary from what may be termed the wide-toothed comb of 100 density to the 700 teeth in the same space. Instead of a gramophone needle being used to pick up the sound, a beam of light does it and transmits the result to a microphone very similar to that employed in broadcasting. By printing the photographic reproduction of the sounds alongside the picture, synchronisation or proper timing is made very easy.

WILL A STILL MORE WONDERFUL INVENTION REPLACE THE TALKIES ?

There is an alternative to the variable density type of sound reproduction in which, instead of the strip showing wide and narrow spaced comb teeth, the width of the photographic reproduction causes the variation in sound and reproduction in the microphone. With the variable width type the minute spot of light which is used for illuminating the slit before which the strip must pass is moved from side to side by electrical currents working in connection with the microphone.

There is much delicate apparatus employed, much of it of an intricate nature, but perhaps the description given above in the barest terms will allow of this marvellous marriage of sound with photography to be understood.

There are still further developments ahead and it may please you to give a thought to the future and think over what you would care to see most—whether more links, through sound and motion pictures, with our past history, or a glance into the future. The film producer is concerned with the past, with the present and with the future, and he will see to it that we share his thoughts and actions in these directions.

NEW YORK
NEW YORK
NEW YORK
NEW YORK
MONTREAL
SHIPS
SYDNEY
CAPE TOWN
CAIRO
BUENOS AIRES
RIO DE JANEIRO

" The switchboard of the world," where telephone subscribers all over the world are put in touch with each other. [*G.P.O.*

MAN SPEAKS ACROSS THE WORLD

There is no " distance " nowadays when people wish to speak with each other. So efficient is our telephone system that, if we wish to speak to Buenos Aires or even to Sydney, on the other side of the world, we need only take up our telephone receiver and ask for the city in which our friend lives. Then, in a little time the bell rings and we are informed that he is listening. His voice comes to us from the end of the earth—and space is shattered. Then the wireless waves take messages with lightning speed—and give us music and speech for our entertainment. Last wonder of all—and fortunate you are to have the inventor, Mr. Baird, himself to describe it to you—comes television, greatest wonder of all.

IN these days there can scarcely be a single inhabitant of any civilised country who has not spoken on the telephone and heard the wireless ; yet telephony was invented less than sixty years ago, and radio as a means of entertainment is so new that schoolboys of fourteen or fifteen must well remember its introduction. Rapid communication is a vital necessity to-day ; without it no trains could run, no newspapers could be published and no commercial firm could carry on its business.

The oldest known method of conveying messages rapidly over considerable distances was by means of beacon fires. There are several old churches and castles in Britain to-day which still preserve the ancient iron basket in which the beacon fire was lit—Edinburgh Castle has one, for instance—but in the days of Queen Elizabeth beacons were so numerous that news of the approach of the Spanish Armada was signalled, by means of a continuous line of fires, from Cornwall to the Cheviots ; as recently as the nineteenth century beacons were erected all over the British Isles to give warning of a threatened French invasion. But beacons have the great disadvantage that they can only report that a pre-arranged time has come or an anticipated event has happened, for a fire indicates nothing unless a message of explanation is previously sent. Nevertheless, beacons served a very useful purpose until they were ousted by quicker and more flexible methods.

Signalling by flags was employed in the British Navy in the thirteenth century, but it was not until about 1665, in the war against the Dutch, that the Duke of York's system of flag-signalling drawn up by Sir William Penn placed the method upon a definite basis. In the eighteenth century M'Arthur, secretary to Lord Howard in the West Indies, invented a much improved system of flags, and a code of lights to convey naval messages by day and night. But all these systems suffered from the same defect, that they could only select from certain pre-arranged messages.

On land the heliograph was used until the present century to convey daylight messages by means of flashes. The heliograph is simply a mirror hinged so as to reflect the sun's rays in a certain direction ; by moving the mirror slightly in a pre-arranged sequence a person in line with the beam receives the message transmitted. This had the great advantage that only a person in the chosen direction could see the flashes, so that some degree of secrecy was preserved, but the great disadvantage that it was quite unworkable when the sun was not shining. In the Afghan War a message was transmitted no less than seventy miles by means of a single heliograph, but a visibility of this distance is, of course, altogether exceptional. It is this necessity of the receiver being actually within sight of the transmitter which is the principal objection to all visual signals.

NECESSITY IS THE MOTHER OF INVENTION: HOW NATIVES SENT MESSAGES.

It was for long a mystery how the dark races living in the African and South American forests communicated rapidly with each other. In the early colonist days the white invaders with all their latest equipment were unable to send messages nearly so fast as the uncivilised blacks, and their approach was known in remote native villages days before they reached them. Instead of using flashes, which would have been impracticable in wooded country, the natives had elaborated a code of drum-taps which were repeated from one village to the next with astonishing rapidity, and formed a sort of audible telegraph capable of conveying a message much quicker than the fastest horseman.

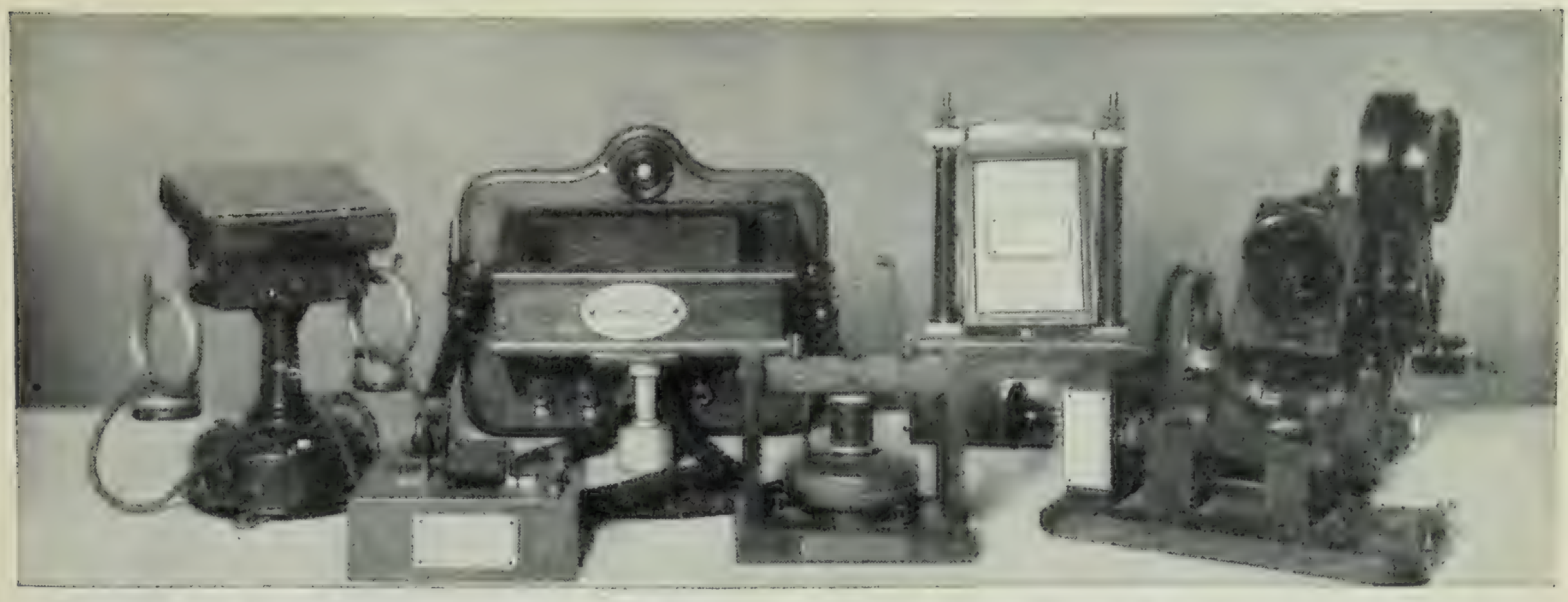
The discovery of the use of electricity paved the way for all modern means of communication. The first suggestion that electricity might be useful for the conveyance of messages arose when Oersted, a Danish physicist, discovered, in 1820, that a magnet could be moved by passing a current through an adjacent wire. Two English electricians, Cooke and Wheatstone, saw the possibilities of this and, in 1835 (only ten years after the first steam railway was opened), introduced a telegraph instrument on which were five needles which, according to their positions, indicated certain letters of the alphabet ; the five needles required five wires and were soon replaced by two needles and, finally, by only one. It is this instrument that is in use on British railways to this day. The system is somewhat slow for general messages, but it is absolutely reliable and admirably suited for the transmission of certain stock phrases necessary in railway work.

HOW MORSE MADE HIS NAME FAMOUS BY INTRODUCING THE CODE SYSTEM.

In 1836, Morse, an American who studied in London, introduced the code system which bears his name, and the first message by electric telegraph was sent from Washington to Baltimore in 1844. This was a tremendous advance. It meant that communication was no longer restricted to persons within sight of each other, but messages could be sent day or night for any distance, although the difficulty of manufacturing suitable insulated cable delayed for several years the submarine telegraph between America and Europe. The Morse code, as every scout knows, substitutes a certain combination of dots and dashes (never more than five) for each letter of the alphabet and the numerals, and the dots and dashes can be received either as short and long buzzes on a sounding instrument or as actual dots and dashes on a reel of paper. In recent years the procedure has been greatly simplified for both sender and receiver (although certainly not for the telegraph engineers !), as by means of the latest telegraph instruments, known as "teleprinters," the sender types his message on a machine like a typewriter, and it is reproduced simultaneously at the other end of the line, perhaps a thousand miles away.

THE CLEVER SCOTSMAN WHO GAVE US THE TELEPHONE.

Another great step forward was made in 1876 when Graham Bell, a Scotsman, invented the telephone, but before going any further it will be advisable to get some idea of how electrical instruments work. The foundation of all electrical machinery, from power-houses and locomotives to vacuum cleaners and electric bells, is the electro-magnet, invented by Sturgeon in 1825. He found that if a coil of insulated wire is wound round a piece of iron and a current is passed through the wire the iron immediately becomes magnetised—a simple enough phenomenon, although why the iron should become magnetised is a mystery to this day. Conversely, a magnet plunged into a coil of wire produces a current in the wire. Now suppose another piece of metal on a weak spring is placed near the iron core of the electro-magnet, then if a current is passed through the wire the metal will be drawn



Curious types of telephones were used in the early days of the invention. Below is the key to the above picture.

against the iron, and as soon as the current is cut off it will spring away again. Here, then, is the basis of the telegraph. The piece of metal can easily be made to strike a bell or turn a needle every time a current is passed, and the circuit can be so arranged that it is broken except when a plunger is pressed, so that every time the plunger is pressed at one end of the circuit the bell rings or the needle moves at the other. There are, of course, numerous refinements in use to give various indications, but the cables by which a message can be sent to Australia, 12,000 miles away, depend primarily on this simple contrivance.

The telephone works upon practically the same principle, but introduces another ingenious idea. A piano wire vibrates when its particular key is struck ; also the wire of a high note vibrates much more rapidly than the wire of a low note. If any thin board or similar article in a room where music is being played is touched lightly where conditions are suitable, it, too, vibrates. Now, it occurred to Graham Bell that if sound produces vibration, then, by reversing the process, vibration should produce sound, and it would be possible to turn the sound vibrations into electric current vibrations which could be transmitted along a wire, and this is the foundation of all the telephones and even wireless sets in use to-day.

Just inside the telephone mouthpiece there is a very thin metal plate with a magnet behind it and very nearly touching it. The speaker's voice causes the plate to vibrate and move very rapidly alternately nearer and farther from the magnet, according to the particular tone and pitch of the voice, and this in turn causes bursts of electric current to pass through small coils which are connected with the magnet ; this current is led through wires to the receiver's telephone, where the process is reversed, i.e., instead of the vibrations of the

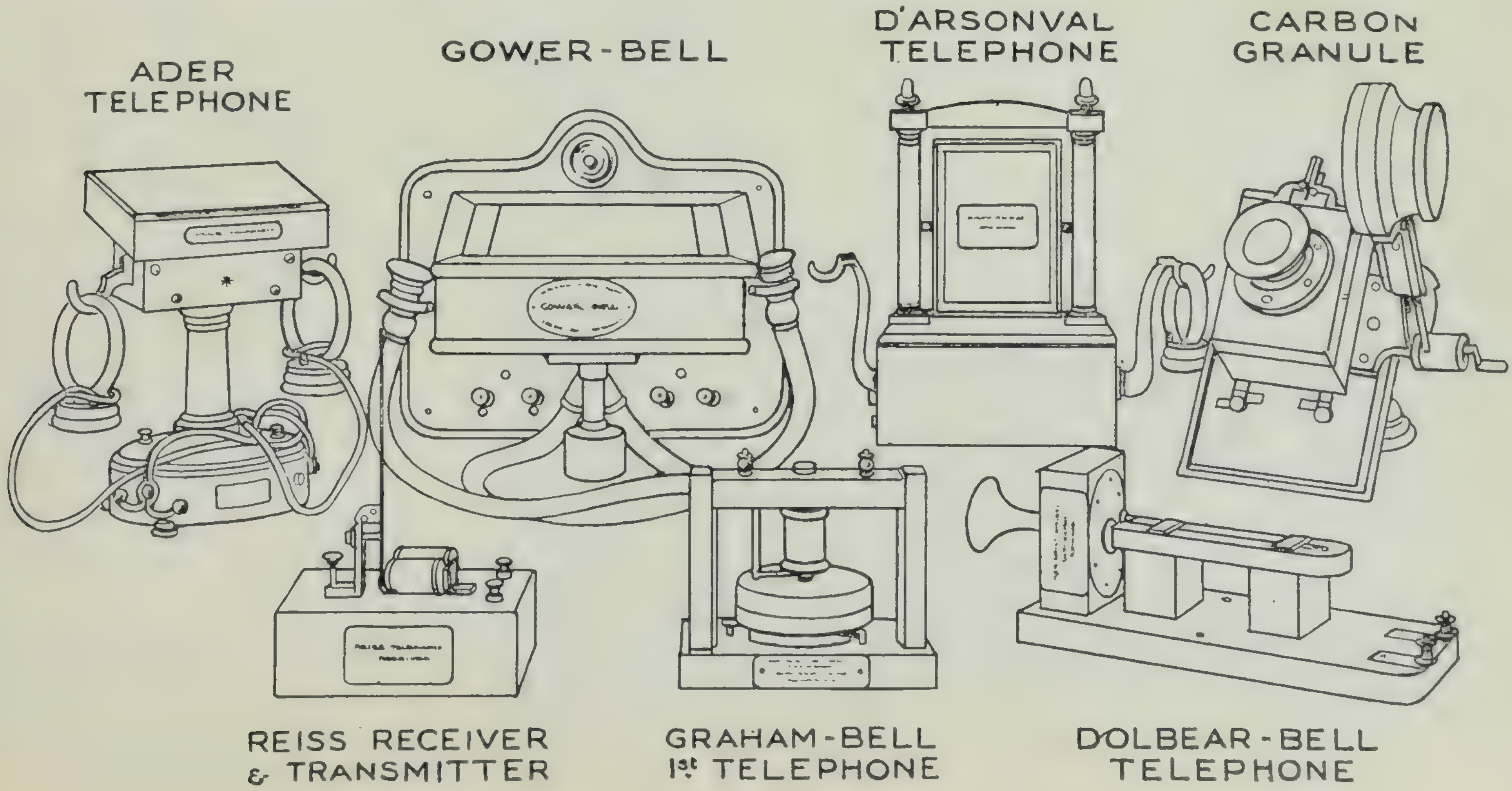


plate causing spasmodic currents, the currents cause the plate to vibrate in precisely the same way as the original plate, and by listening to the ear-piece of the 'phone one hears the voice which is speaking into the transmitter.

As in the case of the telegraph, the telephone in practice is much more complicated than this, as the current has to be strengthened, and, of course, a house telephone can be connected not merely with one other instrument, but with millions of 'phones all over the world. There are about 800,000 telephones in London alone, and it is possible to speak to people in Manchester, Edinburgh, Paris, Berlin, New York, and, in fact, almost anywhere in the world, including far-distant Sydney and Melbourne, as clearly as if they were actually present. Electricity travels so fast that it would circle the world eight times in a second, so that even the most distant listener can hear as quickly as a person on the other side of a room.

All telephone lines in each district are connected with what is known as an exchange, and any local exchange can connect with any other exchange, if necessary, through several intermediate exchanges. Thus, if somebody in, say, village A near town B wished to speak to a friend in village C near town D, he would first be connected from A to B, then from B to D, and finally from D to C, although two or three other exchanges might intervene between B and D, but the speakers would not need to know anything of this, for the telephone operators would connect the lines as desired. At the present time telephone exchanges are being made automatic ; instead of asking the telephone operator for the number wanted, callers may get it themselves by a most ingenious system of dialling. On each automatic telephone is a disc with numbers and letters printed on it, visible through holes in another disc which covers it ; by selecting the first three letters of the exchange name (e.g., CIT for City, CEN for Central) and the number of the person wanted, and turning the top disc accordingly, connections are made straight to the number desired without the attention of an operator at all. Moreover, if the line is engaged, a distinctive buzzing is heard, and if it is out of order a slightly different buzz. There are already 750 small exchanges in country districts which work without any attention apart from a fortnightly inspection by a telephone engineer.

Guglielmo Marconi. [" *Topical* "

WAVES WHICH WANDER ROUND THE WORLD

COMMUNICATION without connecting wires—wireless or radio—is truly a marvel of modern marvels. To understand how wireless works it must be first remembered that apart from the air, the houses, buildings, people and everything else, there is an all-penetrating substance known as the ether—not to be confused with ether gas. Electrical vibrations are able to travel in this strange ether—through bricks and mortar, and through the atmosphere in all directions. Such disturbances can be made very rapidly one after the other, or rather more slowly like waves on the surface of a pond when a stick is wriggled at one side of it.

The two-millionth telephone, presented by the Post Office to His Majesty King George V.

Marconi is the great name in the history of wireless. Although Clark Maxwell and others had discovered that repeated electrical disturbances set up and radiated waves through

The twin aerials at Brookman's Park—the large wireless masts which hold aloft the transmitting aerial.

space, Marconi was the pioneer in putting this discovery to practical use. Guglielmo Marconi was born in 1874 near Bologna in Italy, his mother being an Irishwoman. His first experiments in wireless telegraphy were made in Italy when he was twenty-one years old, and the next year, 1896, they were put to practical use in England. Three years later the world marvelled when he transmitted messages across the English Channel, but this achievement was far eclipsed when he spanned the 2000 miles between Cornwall and Newfoundland. It is pleasing to know that the British Post Office was among the first to realise the possibilities of this marvellous invention and early arranged for the commercial transmission of wireless messages.

HOW MORSE MESSAGES ARE SENT ACROSS THE OCEAN.

The value of Marconi's invention was enormous; it enabled ships to be in constant touch with each other and with their home ports, whereas, previously, they were absolutely isolated during the voyage. Morse messages could now be flashed across sea and land without the necessity of first laying expensive cables. The first ocean newspaper could now be published on Atlantic liners, the news being picked up by wireless, and recently it has led to the wireless telephone and broadcasting. When we tune in our wireless sets we often hear an intermittent buzzing—it is a Morse message being sent probably from a ship in mid-ocean to a port.

In wireless telegraphy the message is sent out as a series of electrical impulses which are discharged into space by the sending station, and picked up by the aerial of the receiving station, where they are changed into sound by much the same means as the ordinary telegraph employs. By the beam system of wireless telegraphy words are transmitted at the rate of 200 a minute.

HOW THE WIRELESS TELEPHONE CAME INTO BEING.

Wireless telegraphy is restricted to the transmission of signals such as Morse, which have to be interpreted before they can be understood by the ordinary person, but it was natural that, having gone so far, electrical engineers were not satisfied until they had a wireless telephone which would serve just as an ordinary telephone, except that no wires were to connect the speaker's instrument with the listener's. This was a much more difficult problem, for it meant that instead of the uniform note necessary for telegraphy all possible changes of pitch and tone of voice had to be transmitted in the form of electrical waves.

However, after thirty years of research it was accomplished, and the first transoceanic

The wireless room in a modern vessel, where communication with the world is possible. Ships to-day are equipped with every device which adds to the safety of travel.

telephone service in the world was opened in 1927 when the British Post Office and the American Telephone and Telegraph Company were linked by radio. This service has been rapidly extended until London has become the central exchange, as it were, of a world-wide system of radio telephony which extends to the British Dominions, North and South America, Egypt, the Continent of Europe and the principal Atlantic steamships ; in fact, nineteen out of every twenty of the world's telephones can now be connected in this way.

The one great drawback to wireless communication at the present time is the lack of privacy. With the telephone there is a reasonable assurance that the only person listening is the one intended to hear, but any one with a good wireless set can pick up wireless messages without much difficulty whether intended for his ears or not. Even this drawback is now being overcome to some extent by the use of an ingenious mechanism known as a " Scrambling Machine," which thoroughly jumbles up messages spoken into the wireless telephone before they are transmitted into space, so that anybody listening in hears only a hopeless jingle of sounds, but the person for whom the message is intended has a machine precisely similar to the speaker's which changes the sounds back into their original form, and, therefore, hears the message exactly as it is spoken !

The magic palace from which music is scattered all over the world—Broadcasting House in London, the vast building which is the centre of B.B.C. activities.

RADIO MAGIC: IS ANYTHING IMPOSSIBLE?

BROADCASTING is an extension of the wireless telephone where the speaker, singer, orchestra, or whatever it may be, is sending a message to the world at large, instead of to one particular person, but there is the vital difference that it is only one-way transmission, not two-way as in the case of the wireless telephone, and it was largely this difference that made the wireless telephone such a difficult proposition. Loud speakers are simply wireless telephones with the power strengthened by current drawn from batteries or, in more recent sets, from the electric house mains.

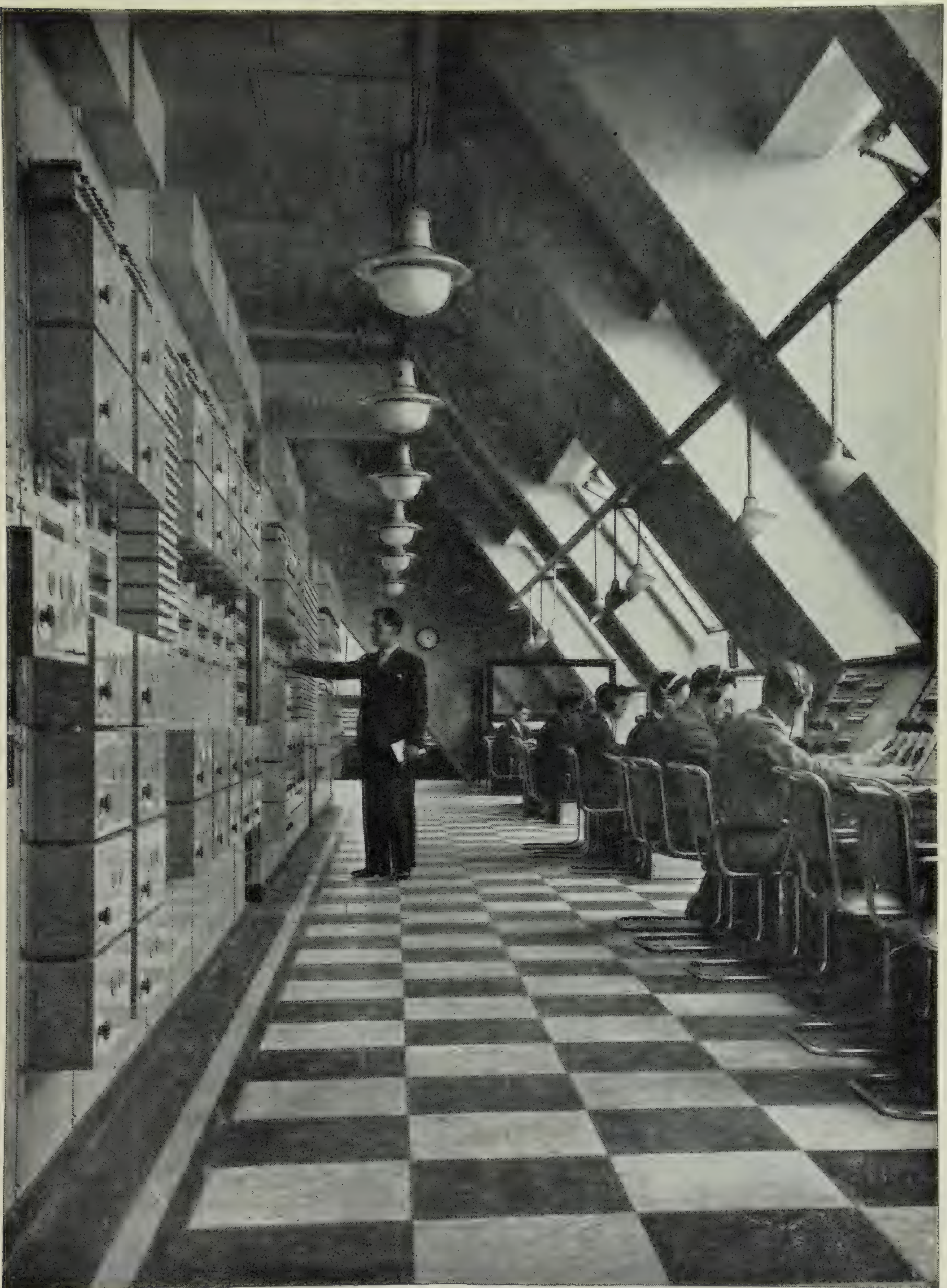
An announcer reading the news. When you listen in, do you ever wonder who is at the other side of the " mike " ?

HOW THE FIRST WIRELESS PROGRAMME WAS BROADCAST.

The first organised attempt at broadcasting in England was made in 1922, when the British Broadcasting Company was formed, although the Marconi Company broadcast from their experimental station at Chelmsford as early as 1920. In place of the few enthusiastic amateur wireless engineers who managed to pick up scraps of talk and music in the early days, there are now 5,000,000 receiving sets in operation in Britain alone. For the sum of ten shillings a year any household in Britain can now listen to the world's best singers and orchestras, and hear speeches by ministers of State, technical experts and even occasionally by H.M. the King himself. Not only this, but one may dance to music played in Paris, listen to the Opera in Milan and endeavour to understand speeches made in Berlin, all without leaving one's own drawing-room.

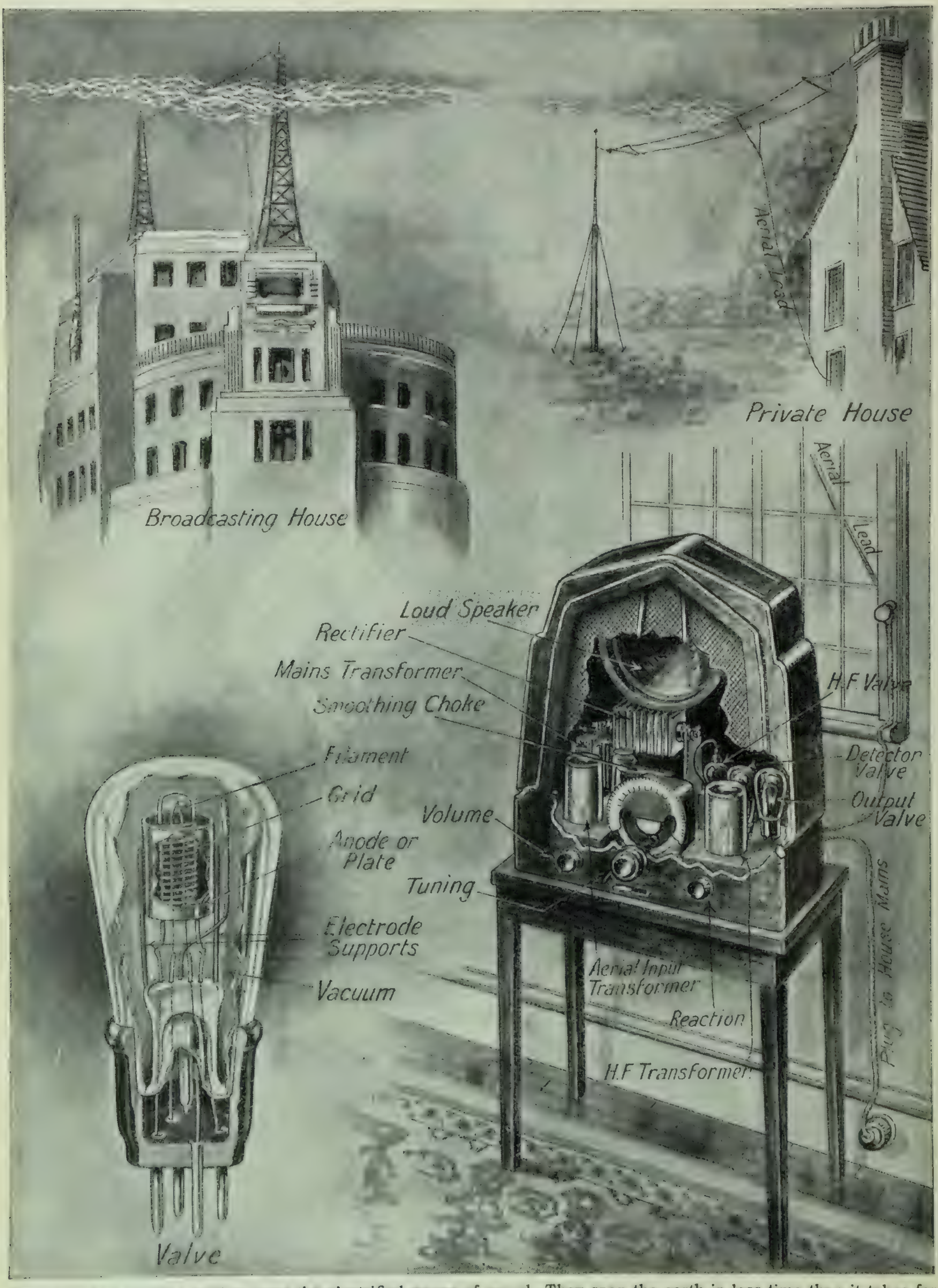
It is not an exaggeration to say that there are wireless stations now broadcasting from all the principal cities in the world, and the total number of listeners must amount to scores of

BOXES OF MAGIC AT BROADCASTING HOUSE



One of the most important departments in Broadcasting House is the Control Room, where engineers are busy linking up the different studios. It is possible for them to connect a singer in one studio with a musician on a different floor.
[B.B.C.

FROM BROADCASTING HOUSE TO YOUR SET


Broadcasting House
Aerial Lead
Private House
Aerial Lead
Loud Speaker
Rectifier
Mains Transformer
Smoothing Choke
H.F. Valve
Detector Valve
Output Valve
Filament
Grid
Volume
Anode or Plate
Tuning
Electrode Supports
Vacuum
Aerial Input Transformer
Reaction
H.F. Transformer
Plug in House Mains
Valve

From the transmitting station come the electrified waves of sound. They span the earth in less time than it takes for an ordinary sound to drift across a room. The aerial of the householder's receiving set picks up the signals, transmits them to the valves and thus to the loud speaker which passes them on to us. The miracle is performed!

millions. Never in the history of mankind has a new invention so rapidly become available to the world in general.

Even the wireless telephone is perhaps eclipsed by the transmission of pictures by wireless. Until quite recently if an event of great importance happened in, say, New York, we would read about it in our papers next morning, and see pictures perhaps a week later. Thanks to the method of sending pictures by wireless, however, the papers can now receive pictures just as quickly as they can receive messages, and illustrations of Monday morning's scenes in New York are shown in Tuesday morning's London papers, and vice versa.

Pictures received by wireless, although quite easily recognisable, are not yet equal to direct photographs. Various systems have been tried, but the foundation of them all is the discovery that light may be made to regulate a flow of current, which in turn regulates a pen, which by innumerable dots or lines describes the picture.

THE WONDER OF TELEVISION

Electric Eyes that Scan the World

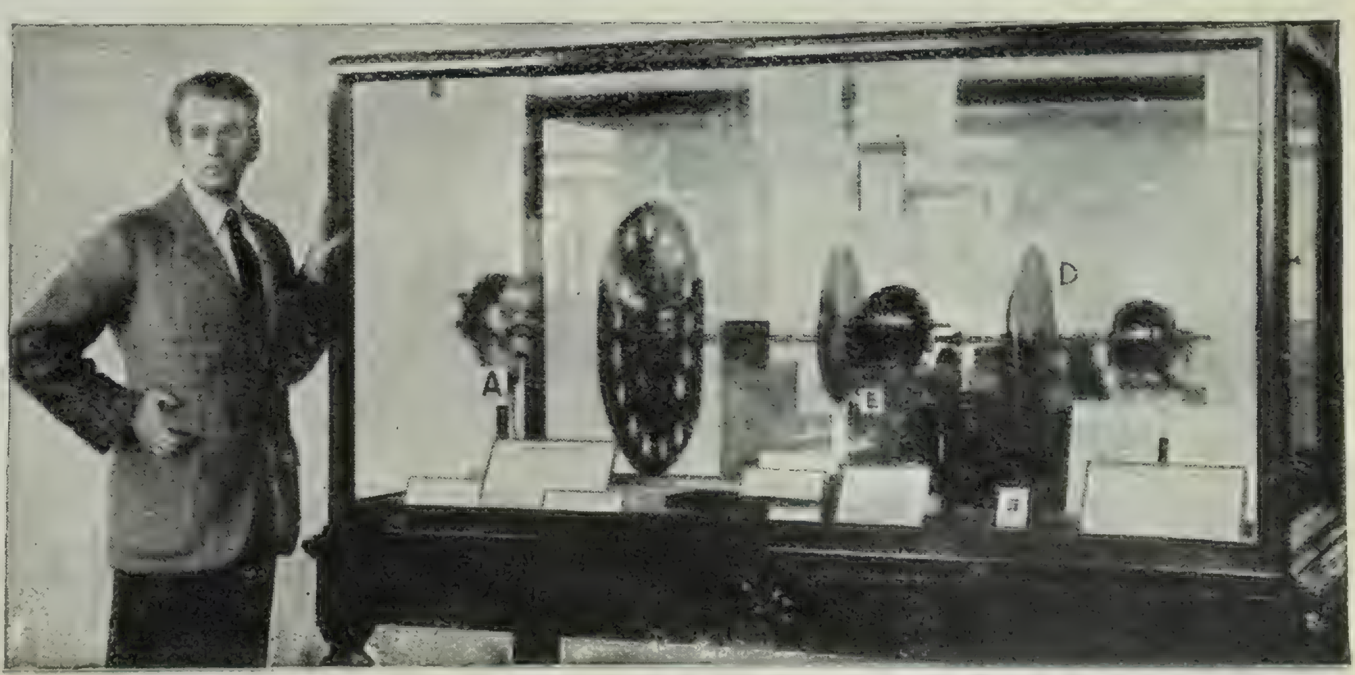
By J. L. BAIRD

We have heard how man has harnessed the sound waves and brought them across the world, at the speed of light, to his own fireside. Is it possible to harness the light waves themselves, and *see* to the ends of the earth? To-day, it is certain that man can do this. To-morrow, we shall "look-in" to the Test Match in Australia or the towering skyscraper in New York just as to-day we can listen-in to the story of the game from Sydney or the orchestra playing on Broadway. More complicated than wireless, with its wave-lengths, valves and hosts of things with long and curious names, this new science of Television, or "seeing at a distance," is one of the most wonderful achievements of man. The delicate instruments which make it possible we owe largely to the genius of a British scientist, Mr. John L. Baird, who, after years of experiment, succeeded in 1925 in "looking-in" for the first time to a distant picture. In 1928 he was able to flash a scene across the Atlantic; to-day the "television nights" are a regular part of the broadcasting programme. Here we have an account, written for us by Mr. Baird himself, of how this wonderful invention works and what it can do.

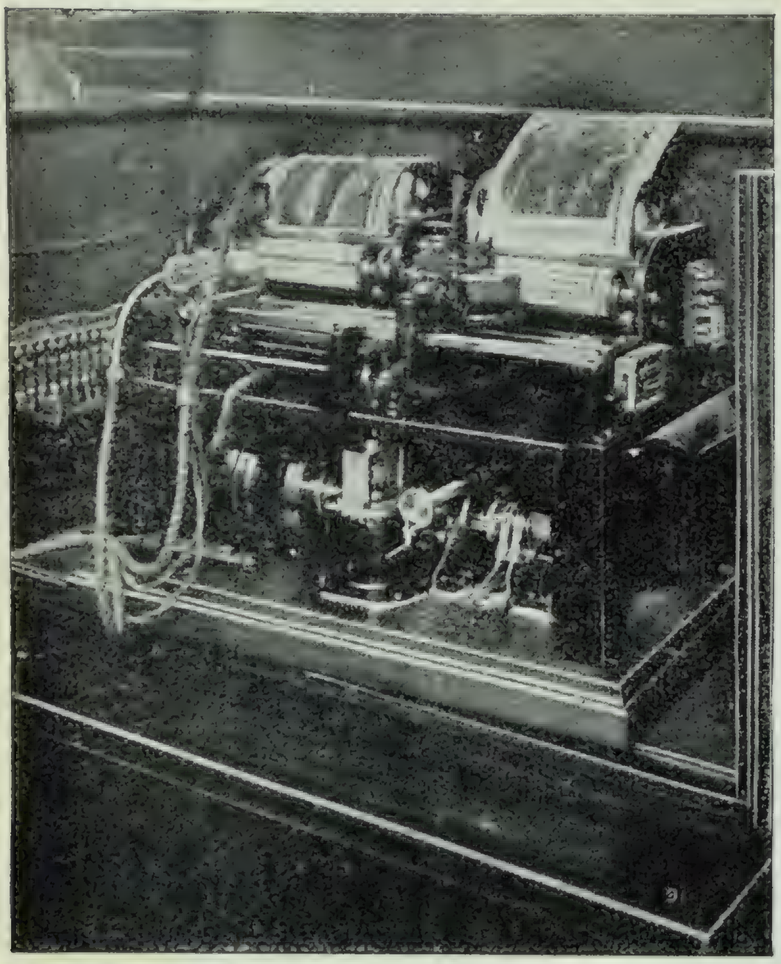
TELEVISION can best be described by comparing it with wireless telephony, or better still, with broadcasting. For when man invented the wireless telephone, he made for himself a third ear—an "electric ear" which can listen, not for a few miles at the most, but round the whole world. In television man has made for himself an extra eye—an "electric eye" with which he can look across an ocean.

In broadcasting, as you know, the person whose voice has to be sent over the wireless sings or speaks into an instrument called the *microphone*, which changes the rapidly vibrating sound waves, made in the air by the speaker's voice, into electric currents which vary according to the strength and nature of the sound waves. These electric currents affect the wireless waves, and the wireless waves affect the receiver in your home, where the loud-speaker turns them back once more into sound waves.

How then can we make a picture or a scene affect the wireless waves? The secret lies in a



First successful "Television" transmitter, made by Mr. Baird, now in South Kensington Museum.



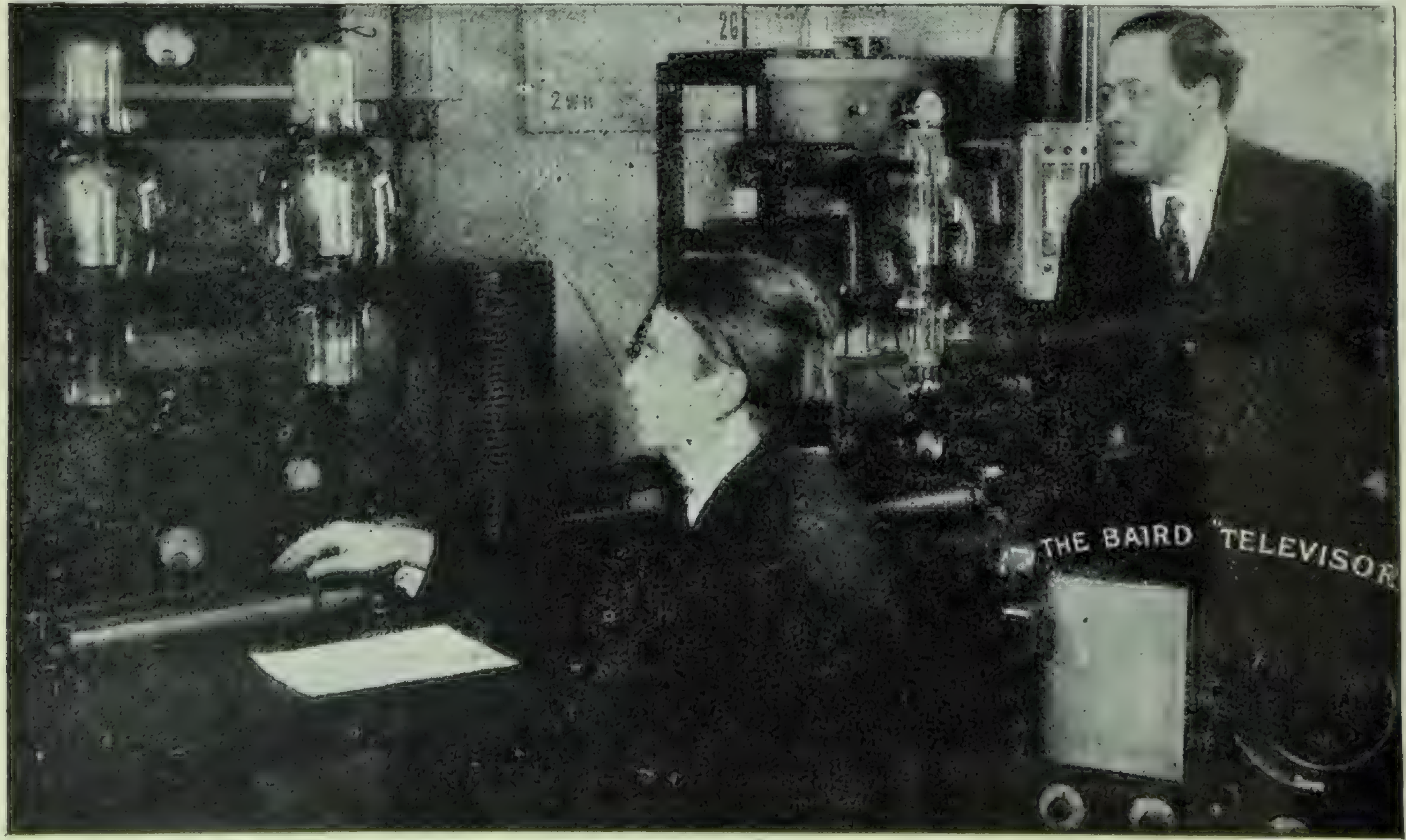
It would seem, when we look at this apparatus for receiving pictures by wireless telegraphy, that the age of miracles is still at hand. The machine is known as the Fultograph.

wonderful instrument which scientists call the *photo-electric cell.* You will have read of the tiny particles called *electrons,* tinier even than the atom of which they are a part ; you will have heard how a stream of these particles moving together in one direction is what we know as an electric current. Now when light waves fall on certain substances, such as the metals sodium and potassium, a stream of electrons is given off from the surface, and this stream, which is really an electric current, varies, of course, with the strength and nature of the light waves themselves.

HOW A TELEVISION SET BRINGS PICTURES TO OUR HOMES.

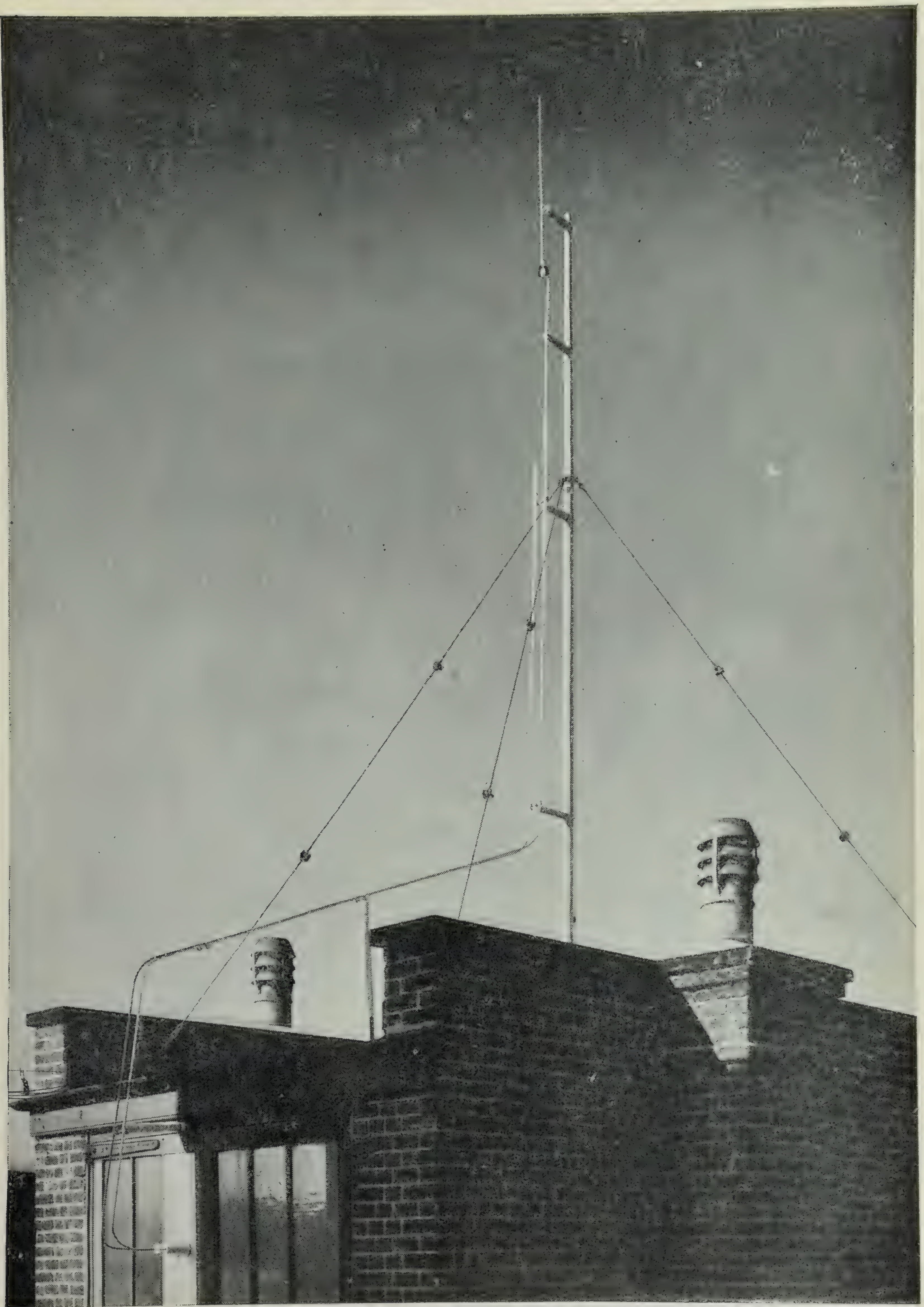
The photo-electric cell contains one of these substances. It is put in place of the microphone, a spot of light is made to pass very rapidly up and down over the picture or scene to be broadcast, and the light waves thrown back from this moving spot fall upon the cell. The nature of these light waves differs, of course, according to the shape and colour of the part of the scene from which they come, and so they cause varying electric currents in the photo-electric cell, just as the sound waves do in the microphone. These varying currents affect the chain of wireless waves which is being sent out from the aerials of the broadcasting station, and these in turn fall upon the aerial attached to the receiving set in your home.

What, then, do we attach to our receiving set in place of the loud-speaker to turn the varying wireless waves back into light ? The *television set,* as the instrument is called, is really quite simple, and can be made nowadays at home from parts which can be purchased quite cheaply. It consists in its simplest form



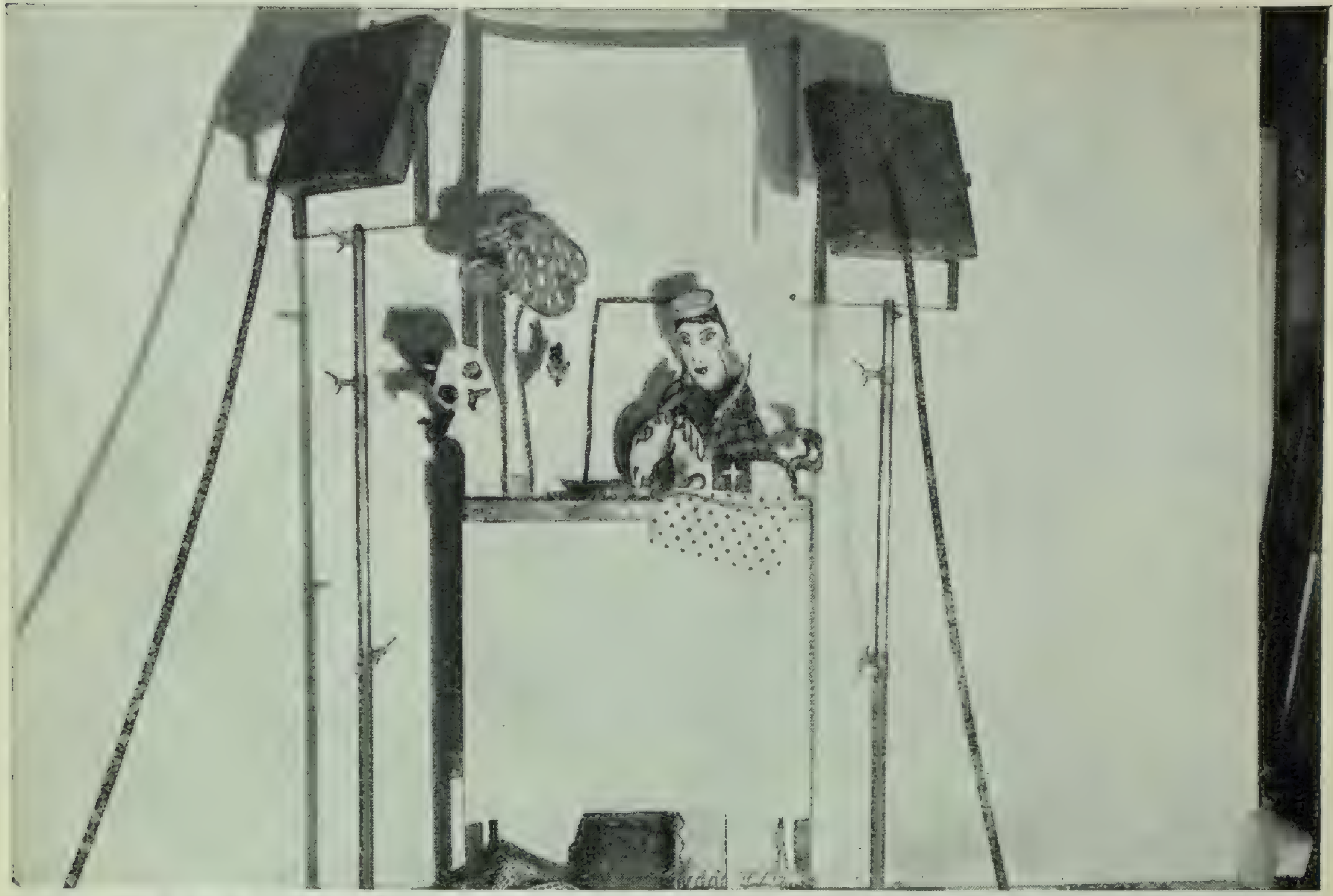
Mr. J. L. Baird, with his assistant, at the transmitting station at Coulsdon, during his experimenting tests.

AN AERIAL HIGH ABOVE THE HOUSE TOPS

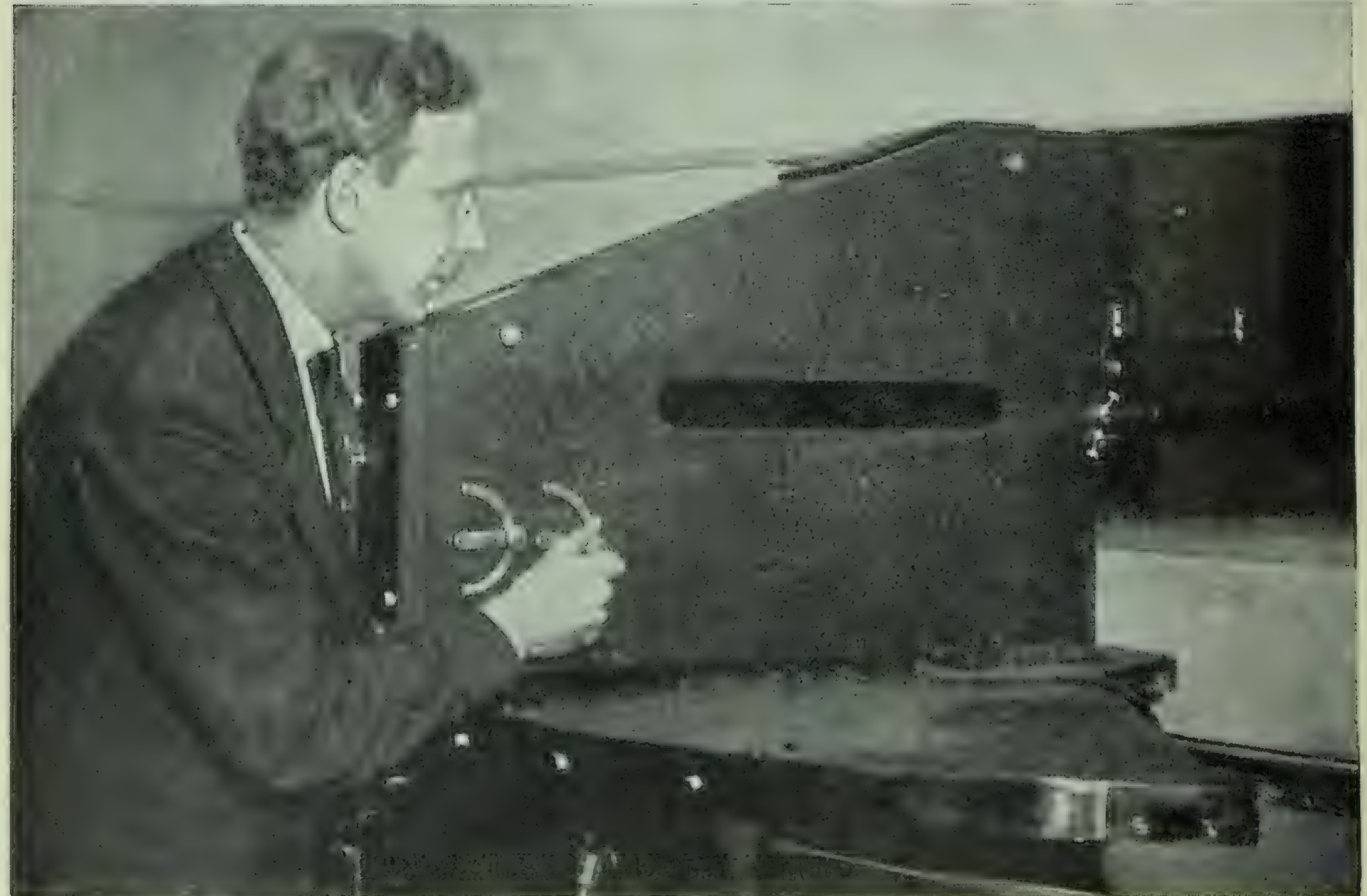


A view of the ultra short wave transmitting aerial of the Baird Company's premises in the heart of London.

WHEN PUPPETS PERFORMED FOR THE SCREEN

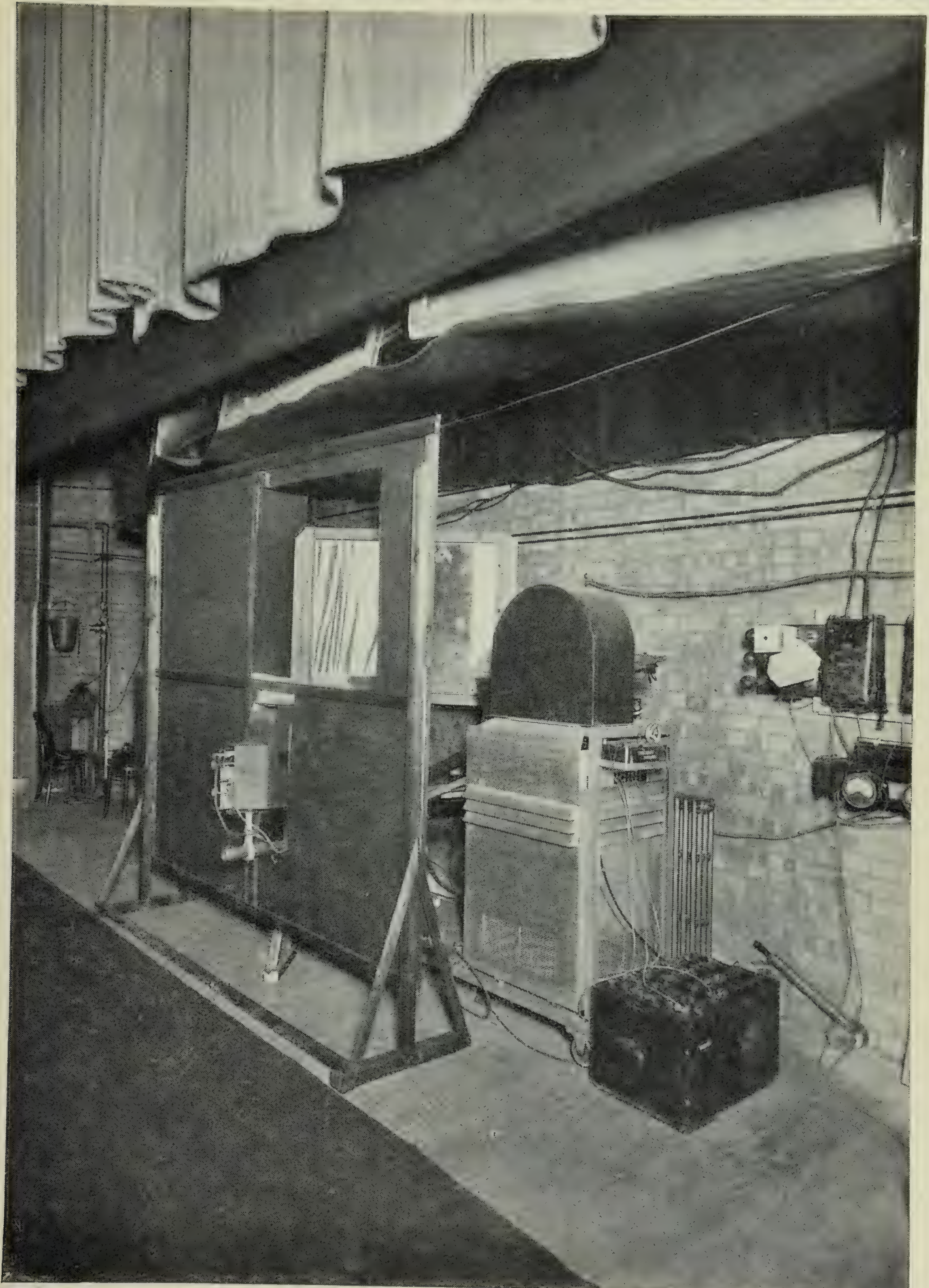


In the early days of television, when experiments were being made, marionettes, called the Pantopuck Puppets, were made to act in the limited screen space. To-day, real artistes, who are able to give interesting and varied programmes, take the place of those puppets. There are television broadcasts from the B.B.C. late in the evenings. [*B.B.C.*



An operator at Broadcasting House, London, is here seen transmitting by television the action of the artistes performing in the studio. The apparatus, The Baird Mirror Drum transmitting set, is shown with sides removed on page 326. [*B.B.C.*

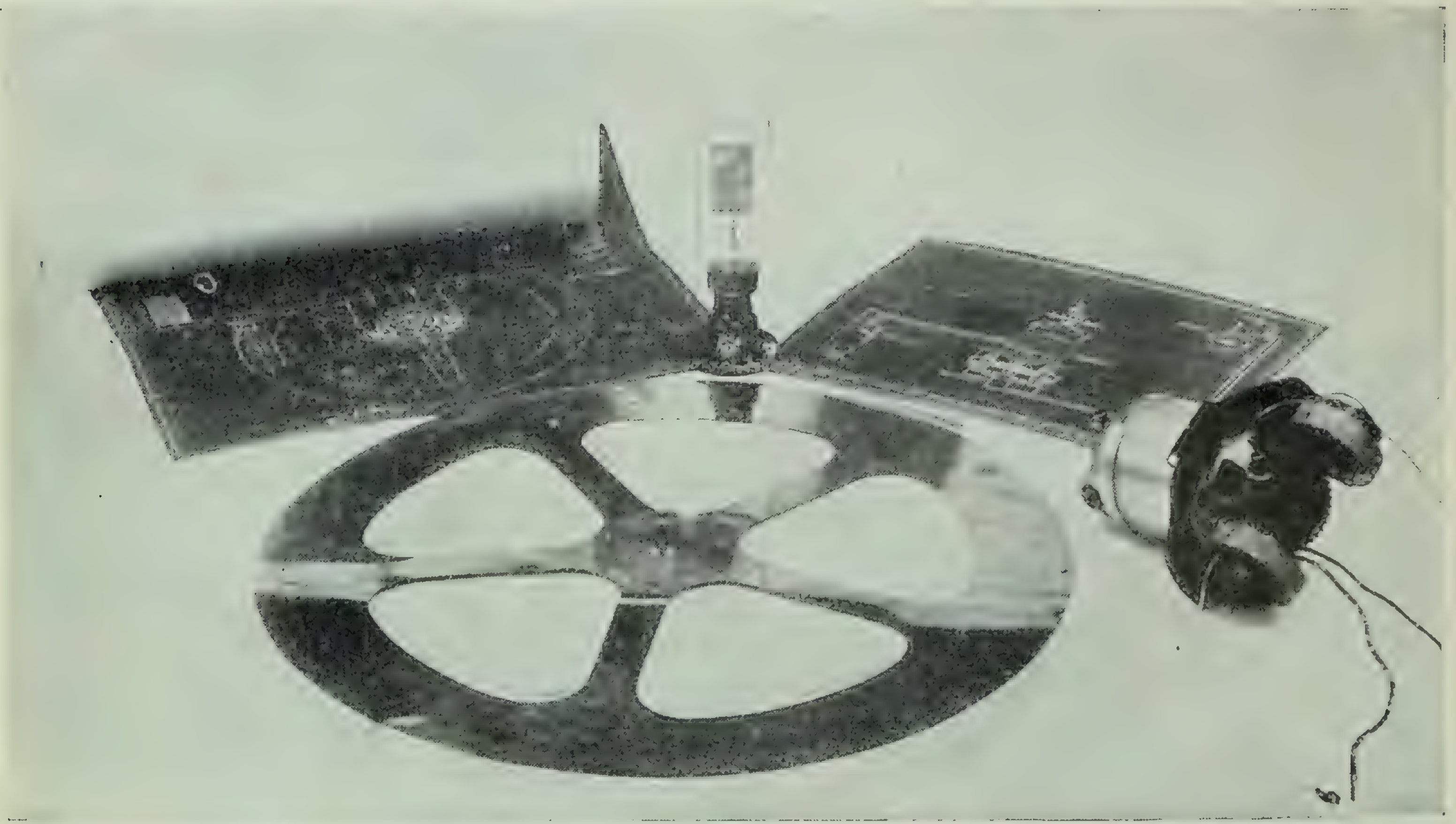
HOW LONDON SAW A HORSE RACE AT EPSOM



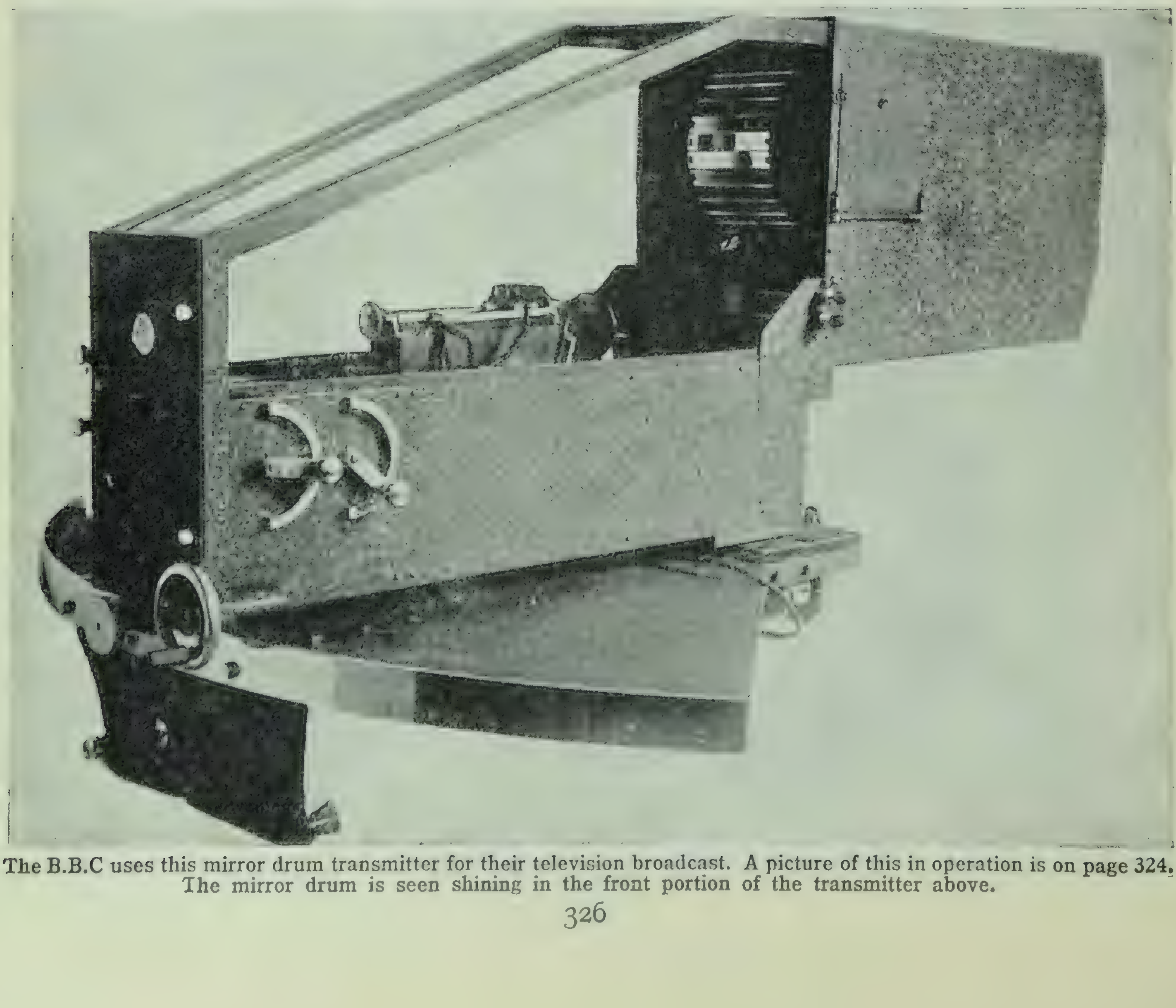
The Baird Television apparatus used at the Metropole Cinema, London, to project the Derby of 1932 by television.

TELEVISION AT HOME AND AT THE B.B.C.

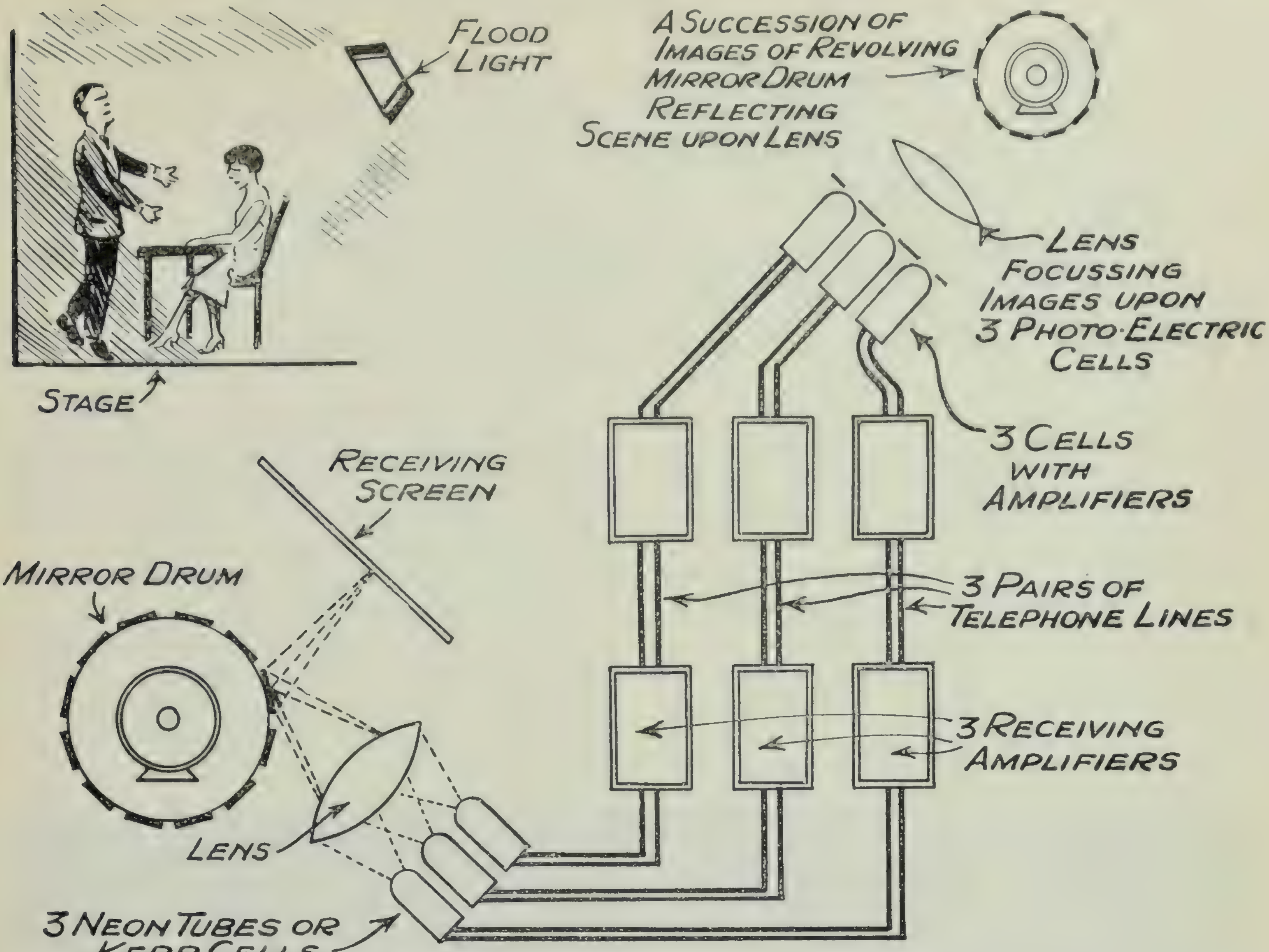
A Simple Set and the Professional Model



The simple apparatus shown above enables the constructor to build a "Baird Junior" television receiving set. On each side of the lamp are seen blue prints showing the constructor how to build the set.



The B.B.C uses this mirror drum transmitter for their television broadcast. A picture of this in operation is on page 324. The mirror drum is seen shining in the front portion of the transmitter above.


FLOOD LIGHT
A SUCCESSION OF IMAGES OF REVOLVING MIRROR DRUM REFLECTING SCENE UPON LENS
STAGE
LENS FOCUSSING IMAGES UPON 3 PHOTO-ELECTRIC CELLS
3 CELLS WITH AMPLIFIERS
RECEIVING SCREEN
MIRROR DRUM
3 PAIRS OF TELEPHONE LINES
3 RECEIVING AMPLIFIERS
LENS
3 NEON TUBES OR KERR CELLS

In the top left-hand corner the players are performing. The diagram shows how their actions are televised.

of a disc of thin metal punched with thirty tiny holes arranged in the form of a spiral. Behind this is placed a small neon lamp, which works very similarly to some of the bright red advertising signs which we see in our big cities nowadays. The lamp is attached to a suitable wireless receiver, and the disc is revolved by a special tiny electric motor at a speed of 750 turns per minute. Then, if the receiving set is properly " tuned-in " to the wave-length of the station broadcasting, the picture which is being broadcast can be seen by looking through the holes in the revolving disc.

A MAN SINGS IN LONDON AND IS WATCHED BY PEOPLE IN DENMARK.

Television is going rapidly ahead. At the time of writing the B.B.C. sends out programmes to which you can " look-in " on four nights a week ; and there are thousands of enthusiastic " lookers-in," not only in this country, but also in Berlin and as far away as the Canary Isles. On one occasion Mr. Carl Brisson, the famous actor, sang songs at Broadcasting House which were received in his native town of Copenhagen in Denmark, and *at the same time* his image was received on a television screen specially sent out there. Thousands of his fellow-countrymen not only heard but *saw* him as he sang in London, hundreds of miles away. If you think about this for a little while you will see what a wonderful difference television can make to our lives in the future.

THE INVENTOR "LISTENS IN" TO THE SHAPE OF HIS HAND.

When I was commencing my first experiments with television many years ago, I was struck by the *sound* which the picture made if the wireless waves were received by a loudspeaker instead of a television receiver. I found that this sound varied in accordance with the object placed in front of the photoelectric cell ; the sound of a hand, for example, was sharp and clear, whereas the sound of a voice was softer and quite different in character. In fact, with a little practice, I found I could distinguish between different objects by the peculiar sound their "picture" made. My next thought, therefore, was : " Why not, then, make a gramophone record of a *picture* ? "

I tried this, and made a record of the sound—and found that it was possible, on playing the record, to turn the sound back into the image. I had, in fact, made the first gramophone record of the picture of a living object.

INVISIBLE RAYS THAT SEE THROUGH A WALL INTO A DARK ROOM.

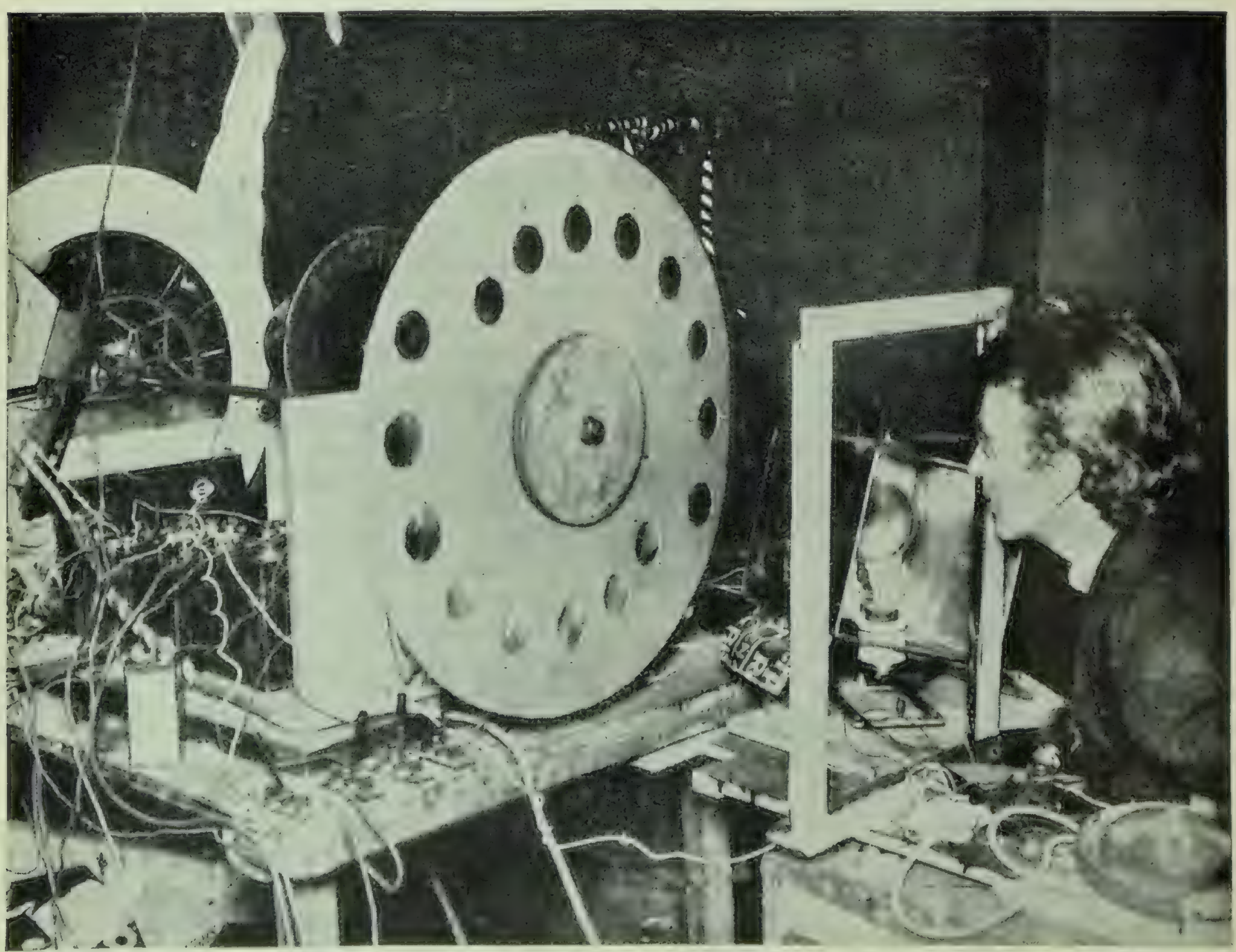
In the early days, too, it was necessary to use a very powerful light in order to send a picture successfully by wireless, and to avoid this it occurred to me that I might use, not the light waves themselves, but some of the other similar waves which we know exist in the spectrum. For although we cannot see these waves, the photo-electric cell can, and, indeed, I found that by using the long infra-red waves it was possible to send a picture of an object, even though the latter was in complete darkness. In other words, I had found a way of seeing through a wall into a dark room!

We have now reached the stage when it is possible to transmit two of our senses—sight and hearing—across the world. The only way we know what is going on is by the information conveyed by the senses. Suppose that in due course the other three senses—taste, touch and smell—can be transmitted, then to all intents and purposes we shall have transmitted ourselves across the world without leaving our arm-chair! Where, indeed, will science lead us if it continues to unfold such marvels as we of the twentieth century have been privileged to see?

. . . .

THE WONDER OF THE LONG INFRA-RED RAYS OF LIGHT.

In another part of this book other uses of the infra-red rays are described, in the section telling how man has harnessed the forces of Nature to his use. You will there see how the rays may perform wonderful feats, such as catching burglars, or taking photographs through darkness or thick fog. If you watch your newspapers and illustrated journals in the future you will occasionally see fine photographs taken by the infra-red process, and will marvel at the keen eye of these long invisible rays of light.



Mr. Baird is here seen at work experimenting with one of his early television sets that paved the way to his later and more perfect transmitter. The spiral of holes in the revolving disc is seen in the centre of the picture. [*Topical*

FOLK STORIES OF THE NATIONS

Continuing our series of stories of olden days—tales handed down among the nations of the world—we come to folk stories of Germany, Russia, Italy and Denmark. Those countries are rich in folklore, and each has its own peculiar type of story. They have been preserved for us through the ages, handed down from generation to generation until they have finally reached this book. They make fascinating reading for children of all ages who are interested in tales of noble princes, beautiful maidens, or fiery dragons. Giant eagles carry us swiftly through the air, and dwarfs and giants amuse us with their clever antics. Reading through these tales, we forget the humdrum everyday life, and are transported to magic lands where impossible things seem to happen quite naturally.

BALDOUR, THE BEAUTIFUL

PART I.

ONCE, long ago, in Germany there lived a handsome youth called Pecopin. He loved the beautiful daughter of the Lord of Falkenburg. Her name was Baldour, and she was so famed for her beauty that everybody called her Baldour, the Beautiful.

She was as good as she was beautiful. She loved to sit for hours at her spinning-wheel or at her embroidery. Pecopin, on the other hand, loved hunting. All day long he spent in the forests that covered his father's mountain. But at nightfall he would go to the castle and stand beneath Baldour's window, singing to her sweet snatches of love songs.

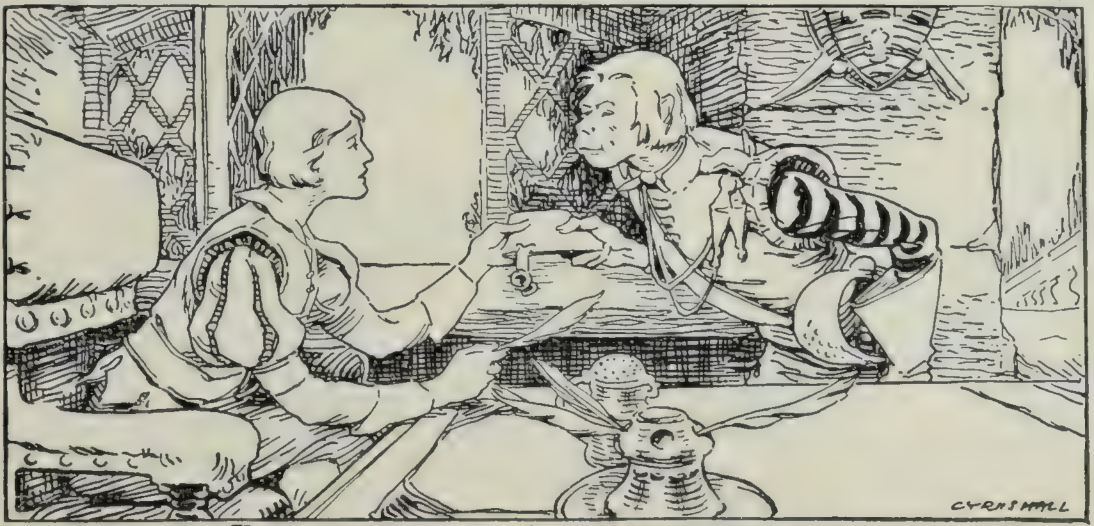
One April day, the two fathers met together and held counsel about their children. It was arranged that Baldour should become the bride of Pecopin.

Pecopin was as happy as the days were long. So, too, was Baldour. She sat at her window each day making fine garments to be worn at her wedding. Pecopin continued to hunt in the forest. Then one morning just before the day fixed for the wedding, Pecopin was stopped in his hunting by the mighty Count Palatine and a throng of nobles.

" Do come with us, Pecopin ! " they begged.

" Where are you going ? "

" We are going to hunt a kite that is killing our young pheasants. We are going to hunt a vulture that is killing our young hawks. We are going to hunt an eagle that devours our young falcons, and so we want you to come with us."



He sent a message to the beautiful Baldour.

" I will come," said Pecopin, and away they all rode.

For three days they hunted. On the first day it fell to Pecopin's lot to bring down the kite. On the second day he brought down the vulture. On the third day he killed the great eagle. Count Palatine was surprised and delighted.

" I must give you my lands at Rheineck, Sir Pecopin. You must come with me and receive them in state."

Now Pecopin was thinking of his marriage, for the day was drawing near. But he did not wish to displease the mighty Count Palatine.

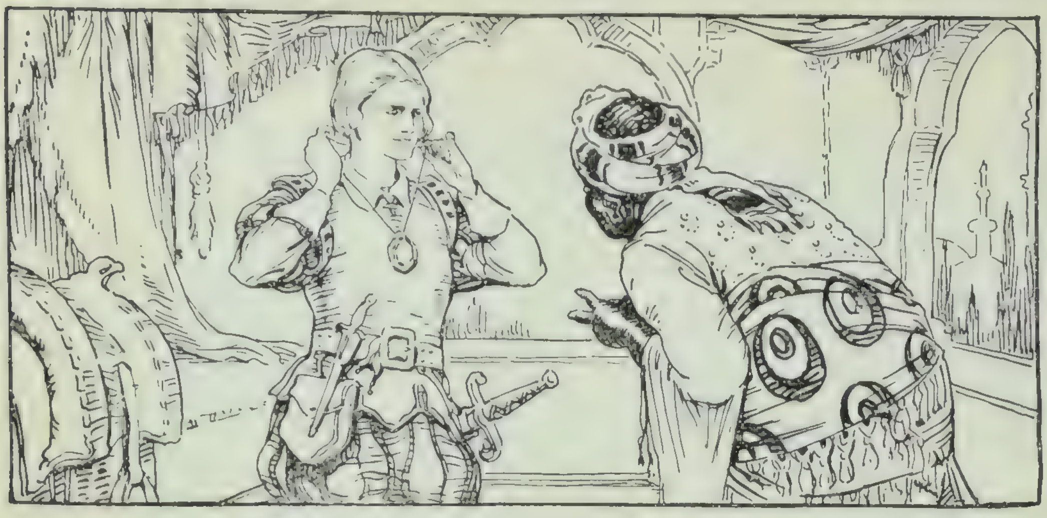
So he sent a message to Baldour, telling her that although he loved her as dearly as ever, yet he had to put off his marriage with her until his return.

Then Pecopin rode away with the Count and his nobles, and he received the lands and castle at Rheineck. One day the Count said to him :

" Sir Pecopin, I wish to send an ambassador to the King of France, and I think I will choose you on account of your bravery."

Pecopin felt highly honoured, and he said that he would go. But at the same time he was much troubled at the thought of keeping Baldour waiting.

However, there was nothing to be done but to go on the long journey to Paris. When he had reached Paris safely, and had taken his message to the King of France, the latter was pleased with his appear-



Pecopin took the charm and hung it round his neck.

ance. Never before had he spoken to such a handsome young man.

"Sir Pecopin," said the King of France, "I wish to send an ambassador to the Moorish ruler at Granada, in Spain, and I think I will send you on account of your charming manners."

PECOPIN IS HIGHLY HONOURED BY THE MOORISH RULER.

Again Pecopin felt highly honoured, and he said that he would go, but at the same time the thought of Baldour troubled him greatly.

Again he sent a messenger to Baldour, and promised her that he would return as soon as possible Then away he went to Granada, and came to the palace of the Moorish ruler.

Here he was very kindly received.

"But," said the ruler, "I cannot sign these papers for the King of France unless I have the consent of the Caliph of Baghdad. Will you therefore be good enough to take the papers to him for me? I choose you because of your wit and good sense."

Now Baghdad was a great way off, but, as there was nothing else to be done, away went our hero to Baghdad

Here he was kindly received also, and feasts were given in his honour.

Now the Caliph's daughter, who had seen Pecopin without being seen herself, fell secretly in love with him.

One night, she sent a servant, an old negress, to Pecopin with a blue stone.

"Sir Pecopin, take this stone," said the negress. "It is sent to you by a princess. She loves you dearly although you have never seen her face. This blue stone is a charm. Whenever you feel that death is near, rub the stone, and you will be saved. As long as you wear it, too, it will keep you young and handsome."

Pecopin took the charm and hung it round his neck, near to his heart.

"This might prove very useful," he thought.

Then he sent a message of thanks with the old negress, and sent her away.

PART II.

But, unfortunately for Sir Pecopin, the Caliph found out that his daughter had sent him the charm. This made him very angry. He sent for Sir Pecopin in a great rage.

"Count Palatine singled you out because of your noble bearing. The King of France did so because of your good manners. The Moorish ruler did so because you had wit and good sense, and now because of all these things, my daughter has fallen in love with you."

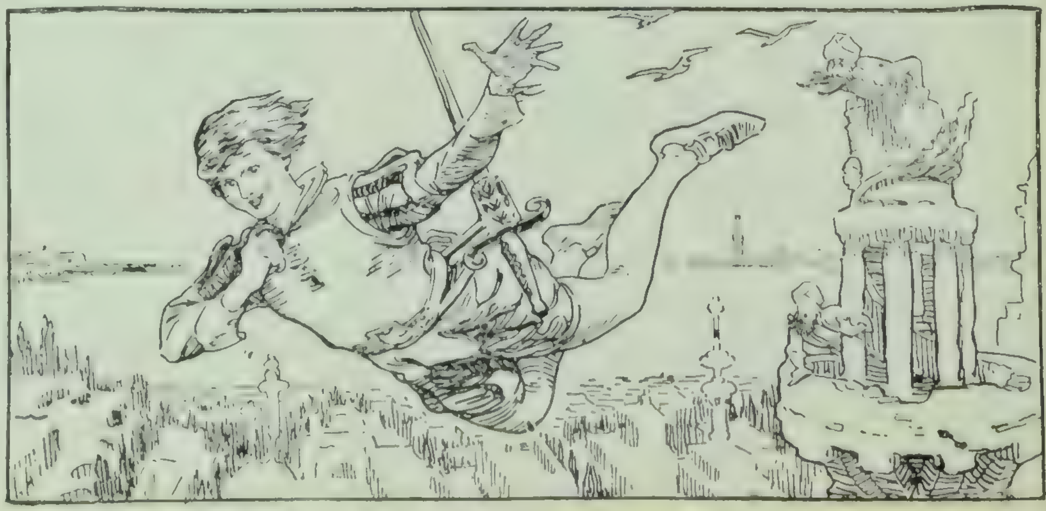
"But I do not even know your daughter."

"That has nothing to do with it. You are a Christian, and she is not. She can never marry you. Now, I must ask you to come with me."

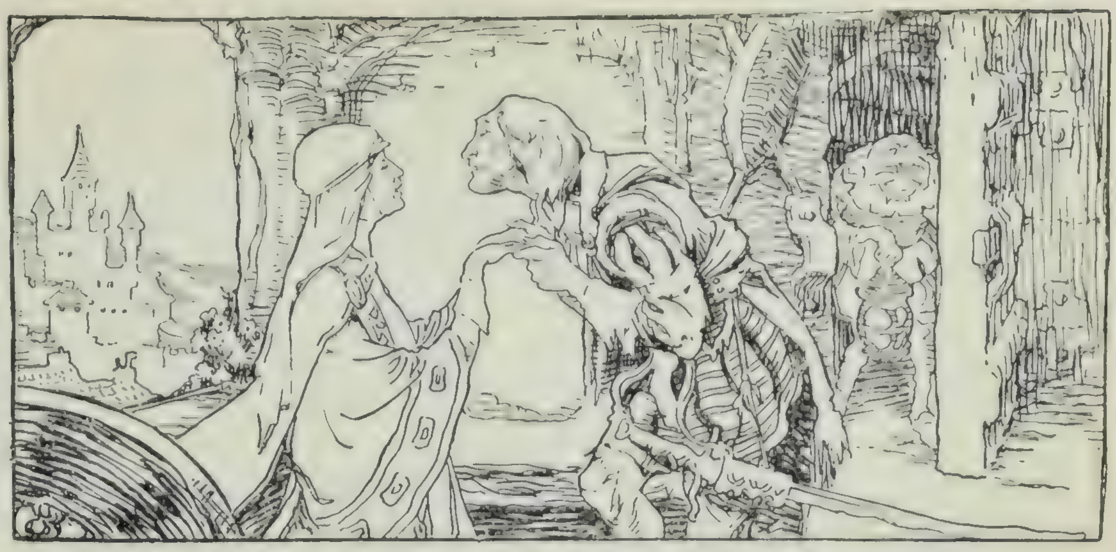
Sir Pecopin followed the Caliph to the top of a high tower. He wondered what was going to happen to him. He was soon to know, for when they had reached the topmost stair, and stood looking down to the ground, far, far below, the Caliph said:

"Now, Sir Pecopin, I will send you on a different journey, and I have chosen you because you are so charming! Ha! ha! ha!"

And with a mocking laugh, he pushed the brave Sir Pecopin right over the parapet!



At once his fall changed into a flight.



"We will both grow older together," he whispered.

Down, down, down, he fell, the wind rushing in his ears. The beautiful face of Baldour seemed to dance before his eyes. He clutched wildly at his heart. As he did so, he happened, by great good luck, to rub the blue stone.

At once his fall changed into a flight. His life was saved! He was filled with joy at the thought, but whither was he flying? He did not know, but on and on he flew, as if on wings. It seemed to him that he had been flying for many hours before his feet touched the earth again.

HOW PECOPIN FOUND HIS WAY BACK TO HIS LADY.

Before him rolled the wide, blue sea. Behind him lay the forest over which he had flown. In this forest he wandered about for years and years, and he had many wonderful adventures. But by reason of his magic charm, which he still wore, he grew no older.

At last he realised that the forest in which he had found himself was none other than the "Forest of Lost Tracks." Pecopin had often heard travellers' tales of this place, and it was said that no one who entered the forest could ever hope to come out again.

Pecopin sank to the ground, feeling weary and exhausted. How could he ever hope to see his beautiful Baldour again?

As he was thinking thus, he heard a loud noise behind him. A strange-looking old man was standing beside a horse.

The old man's beard reached nearly to his feet, but his voice was loud and vigorous.

"I have come to take you back to Baldour," he shouted in ringing tones.

Pecopin fell to his knees.

"Take me, I pray you! I have been trying to find my way to her these long years past."

"Here is a horse for you. Mount it, and I will lead the way."

Pecopin did not know who this strange old man was, but he felt that he was good and that he could trust in him. He tried to mount the horse, but his legs were weak.

"Alas!" cried poor Sir Pecopin. "My legs are grown weak. I cannot even stand."

The stranger offered him a flask.

"Drink," he commanded. "Then you will feel refreshed."

And Pecopin drank. Behold! It was the Water of Life. Pecopin rose to his feet. He felt strangely refreshed.

"I thank you, kind stranger!" said he. But the stranger tapped the bridle impatiently.

"Come," he said, "we must go."

Away and away went horse and rider. Pecopin felt that he must have been riding for hours. The horse suddenly stopped. Pecopin fell to the ground. He forgot everything for a time, and seemed to sleep. When he awoke, he rubbed his eyes, and looked round him.

HOW BALDOUR AND PECOPIN FOUND HAPPINESS AT LAST.

There, to his great surprise, stood the grey castle of Falkenburg! He looked up at the windows. Yes, it was the same. In the twinkling of an eye he had entered the castle gate, and was knocking upon the outer door.

An old, bent, wrinkled servant opened it.

"My lady Baldour! Is she within?"

"Yes, sir. Come this way," said the servant, leading Sir Pecopin to a room in the tower.

"Baldour! My own beautiful one!" cried Sir Pecopin.

But alas! An old, faded, wrinkled woman rose to greet him. Her hair was white as snow. The roses had faded from her cheeks, but it was Baldour!

In a flash Sir Pecopin knew. He must have been many years on his travels, and the blue charm he was wearing must have kept him young.

He flung it away. Instantly his face and figure shrank and dwindled away! He felt very sad, but how could he choose to remain young whilst Baldour had grown so old!

"We will both grow older together," he whispered.

And so they did, for many years of joy and happiness remained for them to share.

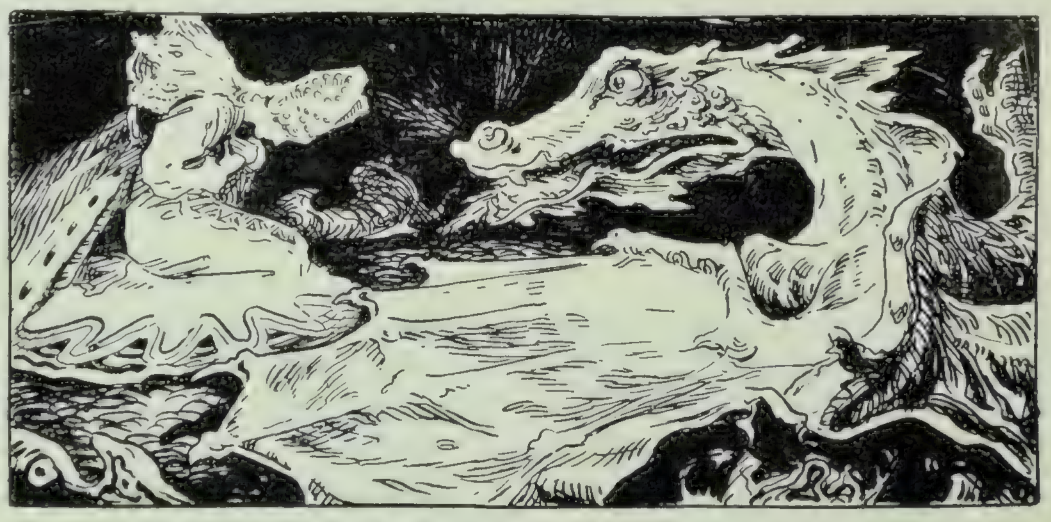
KYRILO, THE TANNER

THERE was once a prince who ruled in the city of Kiev. He was so good and so kind that his people named him "Little Brother to the Sun." His daughter was called Helen the Fair, for her beauty was such as can be told only in a tale.

But sadness came to the city of Kiev. One night a dreadful dragon with a twisted tail came in at the city gate and carried off a young maiden for his supper. The next day he seized another. This went on for some time.

The people in the city were afraid to go out of doors. At last the prince talked it over with his wise men and it was arranged that lots should be cast each day. The house upon which the lot fell was to send a maiden to the dragon.

One day the lot fell upon the palace of the good prince. Helen the Fair was to go and give herself up to the dragon.



The dragon was kind to her and gave her food to eat.

Her father said, "I cannot, and will not, let you go. I will gird on my armour and go to this dragon myself. I will fight him."

BRAVE HELEN THE FAIR GIVES HERSELF UP TO THE FIERY DRAGON.

But his daughter knew that he would fail.

"No," she said, "you cannot be spared from your duty to the people. I will go."

So she said "Good-bye" to the prince and walked through the weeping crowds to the city gates. There lay the monster, with smoking nostrils, ready to pounce upon her.

He took her away to his deep, dark cavern under the rocks. But when he looked at her, his eyes were dazzled with her beauty.

"Thou art too fair to be eaten," he said. "I will keep thee here so that I can gaze upon thy face."

The dragon was kind to her. He gave her food to eat and wine to drink. Then he gave her a nice, clean bed of straw to rest on. She could not sleep all night.

In the morning the dragon awoke.

"I am hungry," he said. "I must go to seek my food. Tell me what shall I bring for thee."

But Helen the Fair replied, "I am content. I want nothing."

"I will bring thee jewels and finest garments, my Princess."

So saying, the dragon left the cave; but before he did so, he rolled two huge stones to the mouth of it, so that nobody could get in and nobody could get out.

THE PRINCESS HAS A BRIGHT IDEA, WHEN HER LITTLE DOG ARRIVES.

Before long, however, the princess heard a scraping and a scratching noise outside the cave. At first she thought it was the dragon returning, but soon she found that it came from her own little dog. He had followed her to the mouth of the cave and was trying to scratch his way inside beneath the big stones. Soon he was inside the cave. How glad the princess was to see him!

Suddenly the princess thought: "I will write a note on a piece of birch-bark and tie it to his collar. He will carry it home to my father."

So she wrote a note, saying that she was safe, and tied it with one of her hairs on to the little dog's collar. She patted him and sent him away.

When the little dog arrived at the palace, he trotted up to the prince and touched him gently with his paw.

The prince, who was thinking sadly, looked down and saw the note tied on to the little dog's collar.

He took it and read it. He was filled with joy to know that his daughter was alive. At once he wrote a note telling her to be of good cheer. He tied it to the little dog's collar and sent him back.

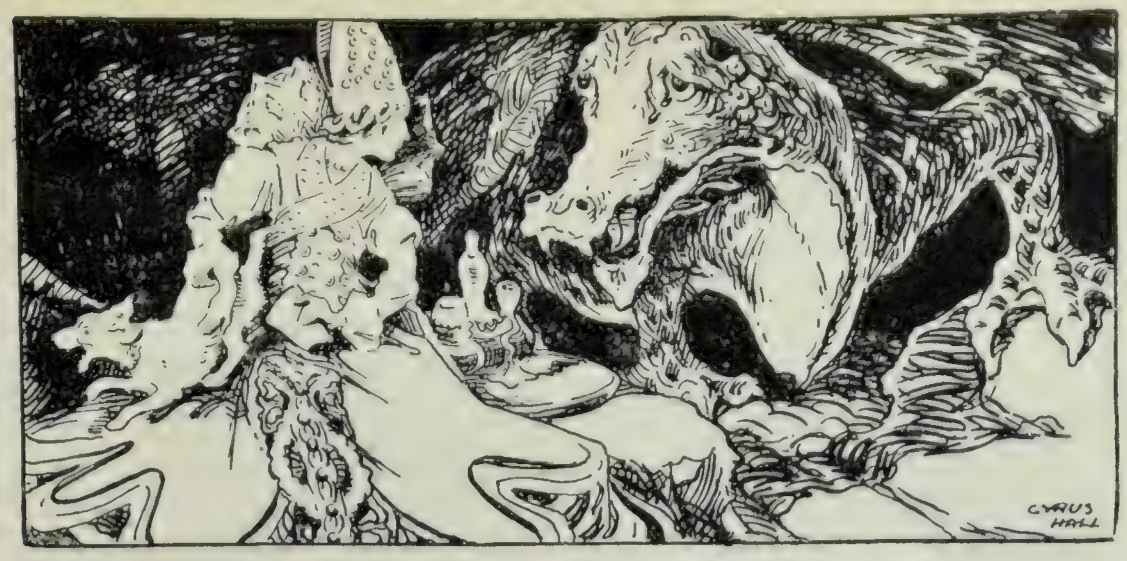
The princess heard the dragon returning just as she was reading her father's note. She hid the letter in her pocket and pushed the little dog into a hole in the wall.

When the dragon came in, she asked, "What has kept you away so long? You look sad."

"I am troubled," was his reply. "Give me food and drink, and then I will tell you why."

Helen gave him meat and drink and then

the dragon said, "This day have I heard sad news. In the city of Kiev there dwells a tanner. Kyrilo is his name. He is a mighty man and strong. He is mightier than I. If it should happen that I roused his anger I should not be able to stand against him."



"Why are you sad?" the princess asked the dragon.

THE BEAUTIFUL PRINCESS SINGS THE DRAGON TO SLEEP.

On hearing this, the princess was well pleased. She sang him to sleep with sweet music. When he was snoring she took a piece of birch-bark and again wrote upon it.

"The dragon is afraid of Kyrilo. I only know that he dwells somewhere in the city of Kiev. He, and only he, can prevail against him." She tied this message to the dog's collar and sent him away again to the palace.

The prince was eagerly awaiting him. He read the note and almost jumped for joy.

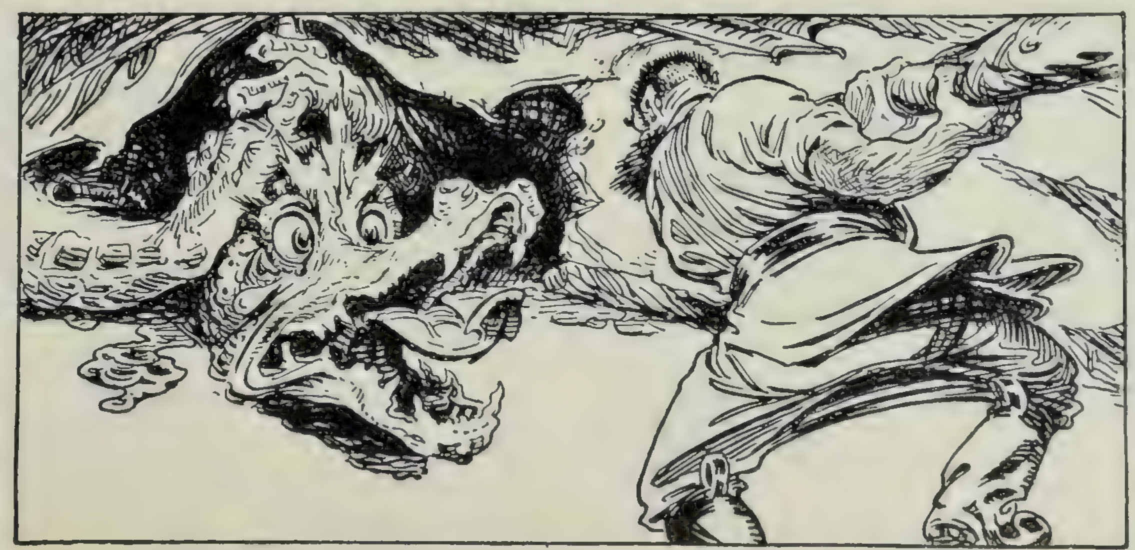
Then he sent his heralds round the town, calling upon the name of Kyrilo, the tanner. When Kyrilo heard, he left the hides that he was tanning and hurried away to the palace.

"I bid you go forth to the dragon's lair and challenge the beast to fight," said the prince, "With God's help you will win."

Kyrilo was stupid. He did not know how strong he was, and he did not want to fight. He scratched his head and stroked his beard.

"No! No! I cannot fight a dragon. Who would tan my hides whilst I was away?"

"I command you to go in the name of all the fair maidens of this city. Of you alone is the dragon afraid."



"Have mercy!" begged the dragon, shivering with fear.

Kyrilo did not want to go at all. But when a group of maidens came and bowed down to him, wringing their hands and begging him to go, he left his hides and went.

He tore up a tree stump for a weapon, stood outside the cave and called:

"Come forth, you skulker in the dark!"

When the dragon heard his voice he grew pale with fear.

The dragon slowly showed his head at the mouth of the cave. As soon as he did so, Kyrilo swung his club and dealt him a heavy blow.

THE TANNER SLAYS THE DRAGON AND THE PRINCESS GOES FREE.

"Have mercy! Oh, have mercy!" he begged.

"Thou didst not show mercy to our young maidens," cried Kyrilo, and with that he smote the dragon again. Then the fight began.

Three times three went Kyrilo and the dragon round the field.

In the end, Kyrilo the tanner slew the mighty beast.

All the bells in Kiev rang out merrily. The young maidens came forth decked with gay garlands to greet Kyrilo and their fair princess.

"Brave Father Kyrilo!" cried the prince. "How shall I reward you? (Let me fill your vats with gold."

"How then shall I tan my hides, O Prince?" cried good Kyrilo. "All that I did was for our young maidens and our lovely princess. The dragon will trouble them no more. That is thanks enough for me."

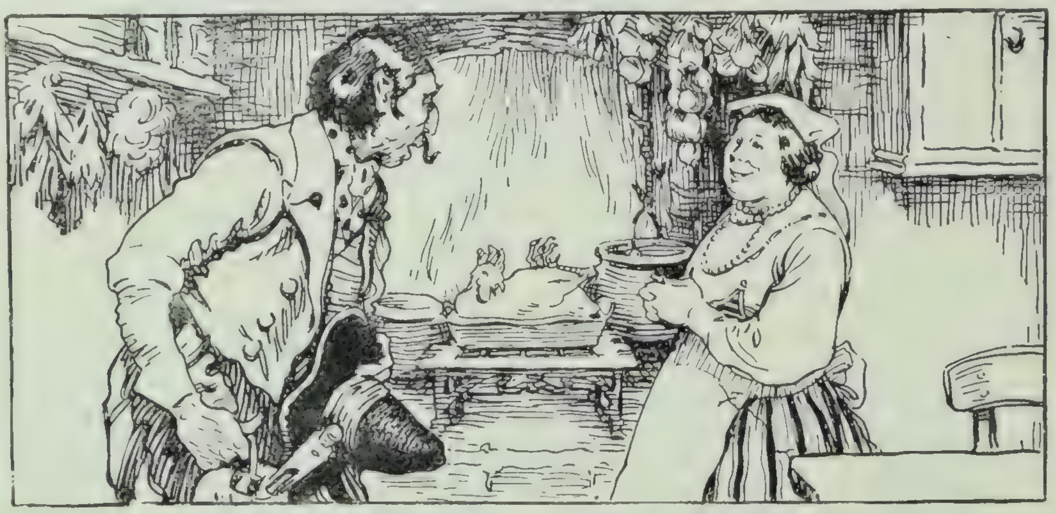
So saying, the good peasant went back to his work and the princess went back to her palace. As for the dragon, the people took him and cast him into the sea, where he remains to this day!

THE FEAST DAY

A YOUNG boatman once lived in Venice. One feast day he said to his wife :

" Wife ! I am going to market to buy a fowl. Will you cook it nicely for our dinner, please ? I will bring my friend Antonio home with me and he can share our feast."

" Yes, I will do my best," said the wife, and when her husband brought home the fine, fat fowl, she plucked it, and cleaned it, and then put it into the roasting-pan. Her husband went out to work, saying, " I will be back at one o'clock."



" Cook the fowl for our dinner, wife," said the boatman.

Now whilst the fowl was beginning to roast before the fire, the good wife thought :

" I may as well go to church and say a prayer until the dinner is ready to serve," and she put on her hat and her coat and went to church.

THE GREEDY DOG AND CAT ARE ATTRACTED BY THE SMELL OF THE FOWL.

Hardly had the door closed behind her than the dog, who had been sleeping on the mat, awoke. He yawned, stretched himself, and walked over to the fire. He sniffed the air.

" My ! What a good smell ! " said the dog to the cat.

" It is," agreed the cat.

" See if you can pull down that roasting-pan with your sharp claws, Pussy ! " said the dog.

So the cat went to the pan and scratched and pulled with her sharp claws. Crash ! Down it fell with a clatter to the floor.

The dog pulled the pan under the table and then he said :

" Now, shall we eat half of this fowl ? "

" No," said the cat, " we will eat it all."

So they began to eat, and soon there was nothing at all left in that pan but a few bones !

Then the cat and the dog began to think about what they had done.

" Oh ! " said the dog, " what will our mistress say when she sees that we have eaten her good dinner ? "

" She will be sure to beat us," said the cat.

" Then let us hide," said the dog.

So the naughty pair ran about the kitchen, trying to find a good hiding-place. They ran under the table.

" Mistress will be sure to find us here," they said. " Let us run upstairs and hide under the bed."

So they ran upstairs and hid under the bed. It was not very comfortable under the bed, for there was not much room. Downstairs they ran again.

The cat looked up at the ceiling and spied the cross-beam.

" That is the place for me ! " she said, and getting first on to the table, she sprang high into the air. She managed to reach the beam with her two front paws, then she tried to wriggle the rest of her body up as well. But she could not.

" Come down ! " cried the dog. " Your tail is hanging down like a bell-rope. Mistress will be sure to see you there."

" I can't," cried the cat. " My paws are stuck fast."

" Wait a minute. I will pull you down," said the dog.

He jumped on the table and clung on to the cat's tail. But to his horror he found that he, too, was stuck fast !

THE MISTRESS RETURNS FROM CHURCH AND FINDS THE PAN EMPTY.

They twisted and turned, and turned and twisted, but it was all of no use. They could not get free.

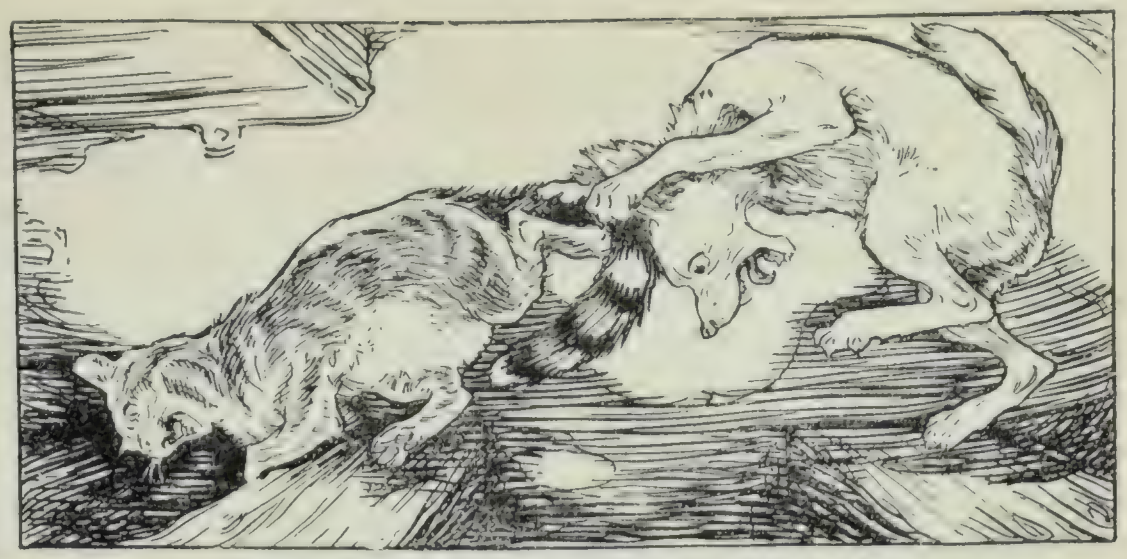
Soon the mistress returned from church. She ran straight to the fire-place to see how the fowl was cooking.

" What ! No dinner ready ! What can have happened ? "

Then she looked under the table, and there she saw the empty pan and the bones lying on the floor.

" Ah ! Ah ! " she wept. " My dinner is all gone. The cat and the dog have done this, I am sure. But let them wait ! "

She picked up a stick and ran to look for them. She looked under the chairs. They were



They twisted and turned but could not get free.

not there. She looked under the sofa. They were not there. Then she looked up.

"Ah! There you are," she said. "Just you wait a minute!"

She climbed up on the table and tried to pull the dog down. But to her horror she found that she, too, had stuck fast! Her husband came tapping at the door.

"Wife! let me in! I hope dinner is ready."

"I can't. I am stuck fast to the dog's tail!"

"What! I'll give you dog's tail! Open the door at once, you stupid woman."

READ TO THE END AND YOU WILL BE OPEN-MOUTHED!

Then he kicked the door with his foot until it swung open.

"What are you all doing?" he shouted. "Wait a minute. I will pull you down." And he put his arms round his wife's waist to pull her down, but he, too, stuck fast!

"Ow! Ow! We are both stuck now!" cried the husband.

Antonio then came tapping at the door. "Is dinner ready yet?" he called.

"Come in and help us!" cried the good wife.

Antonio pushed the door open and went inside. He laughed and laughed at the funny sight.

"I will set you free," said Antonio.

Then he gave the cat's whiskers such a tweak, that the cat gave such a squeak, and plop! She fell straight into the dog's open mouth! Then the dog fell straight into the woman's open mouth! The woman fell straight into the man's open mouth!

As for Antonio, he fell straight into the open mouths of all the people who are listening to this silly tale!

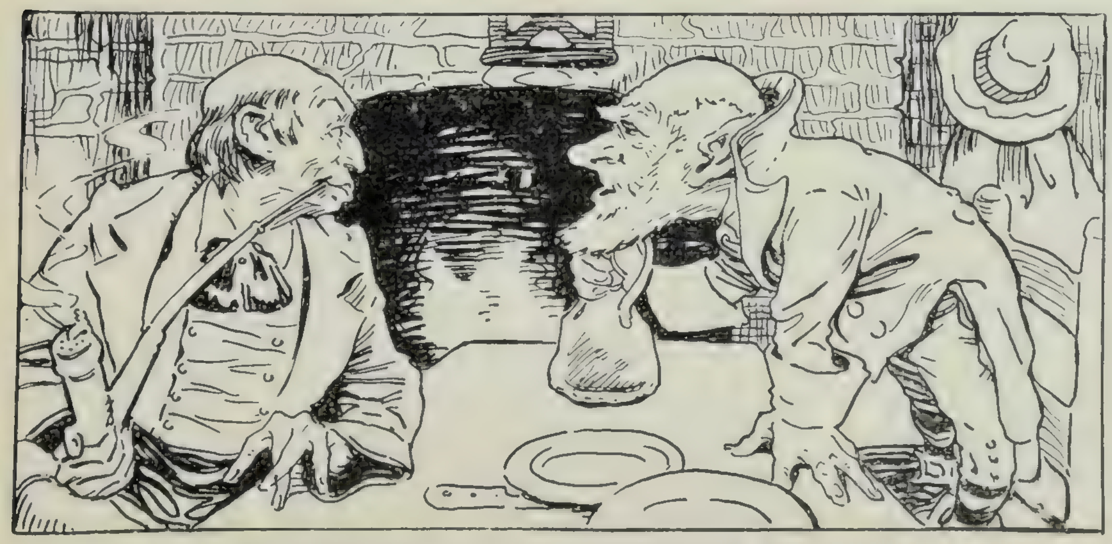
THE ADVENTURES OF SVEND

PART I.

SVEND IS BROUGHT INTO CONTACT WITH MANY QUEER PEOPLE

ONCE upon a time there lived in Jutland a poor peasant with his wife and baby son, who was called Svend.

One winter, times had been very hard indeed. There had been no work for the poor man to do and his stock of savings was very small. When at last there was no money left, he had to give up his house, and go forth with his wife and baby son to seek work elsewhere.



He gave the poor man some bread and milk.

On their way they came to a thick forest. In the middle of the forest, by some unhappy chance, the husband and wife were separated from each other. Each wandered on and on, hoping to hear the sound of the other's voice, but in vain.

At last the husband came upon a big house. Hoping that perhaps his wife and little son had found shelter within, he tapped at the front door.

To his horror, an ugly troll, or dwarf, answered his knock!

"Have you, by chance, seen a poor woman with a baby in her arms, wandering this way?" asked the peasant.

The troll replied that he had not, and after he had given the poor man some bread and milk, and they had talked still further, the troll offered him a purse.

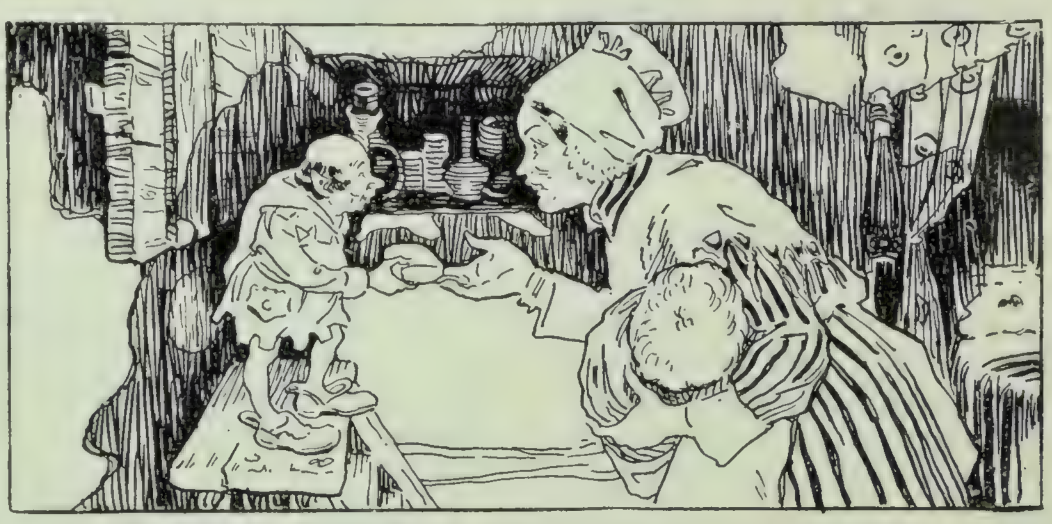
"This purse has the magic property," said the troll, "of always remaining full, however much is taken out."

"That would, indeed, be a fine purse to have," said the peasant.

"I will give you the purse on one condition," said the troll. "You must give me your son when he reaches the age of fourteen."

"Indeed, I will not! Do you think I would sell my son for gold?"

"Then if you do not send me your son, you must come to me yourself," said the troll. "You have set foot in my house, and now I have you in my power."



He went to the cupboard and took from it a small packet.

THE PEASANT WOMAN MEETS THE TINY "MAN OF THE MOUNTAIN."

But the terrified peasant managed to escape by the back door when the troll was not looking. Away he ran through the forest, and after a long and tiring journey he managed to find his way home. There he waited, hoping that his wife and baby would soon find their way back.

But things fell out differently. The wife had met a tiny elf-man in the forest. He was weeping, and he seemed to be so glad to find some one to whom he could tell his troubles.

"My wife is so ill. I fear she will die. What shall I do?"

The peasant woman was tired and hungry, but her heart was kind.

"If you will show me the way to your home, I will come and help you to nurse your wife," she said.

The little "Man of the Mountain," for so he turned out to be, thanked her warmly. He led her to the mountain, in which he lived, and he took her through a wee trap-door beneath a stone to his home.

The good peasant woman found the place in a very untidy state, but she quickly set it all in order, looked after the little man's wife, and nursed her well. Before many weeks had passed the invalid was quite well again, and her little elf-husband was full of joy.

THE ELF-MAN GIVES THE PEASANT WOMAN A REWARD.

"Now you must have a reward for all you have done," said he to the peasant woman. "Tell me what you would like to have."

"I want no reward," said the good woman. "I have only done my duty. Besides," she added, "have you not given me and my little son food and shelter during our stay here? That is reward enough."

But the little man would not have it so. He insisted on giving her a reward. He went to a cupboard in the wall, and took from it a small packet.

"Take this," said he. "It contains a bear's hair, a fish's scale, and a bird's feather. Keep them for your son, and if he should ever need help, he would only have to press the hair and the King of the Bears would appear before him. If he should press the fish's scale, the King of the Fishes would appear, and if he should press the feather, the King of the Birds would come to his aid."

"Thank you," said the woman. "This is a wonderful gift. I will keep it until my son is older."

"One thing more," said the little man. "This is your son's destiny. He will grow up to be rich and brave and handsome, and one day he will marry the King's daughter!"

So saying, he led the peasant woman to the door of the mountain. There they bade each other farewell, and the woman and her son set out on their homeward journey.

When she reached home, she found that things had gone well with her husband. He had found work as a wood-cutter and he was, of course, delighted to see his wife and child again. She told him all about her life in the mountain, and he told her about his adventure with the troll.

PART II.

SVEND GROWS UP AND MEETS WITH MANY ADVENTURES

NOW the good woman could not help telling her neighbours about the little " Man of the Mountain," and what he had foretold about her son, Svend.

So the news went round, as such news will go, from one mouth to another, until, at last, it came to the ears of the King himself.

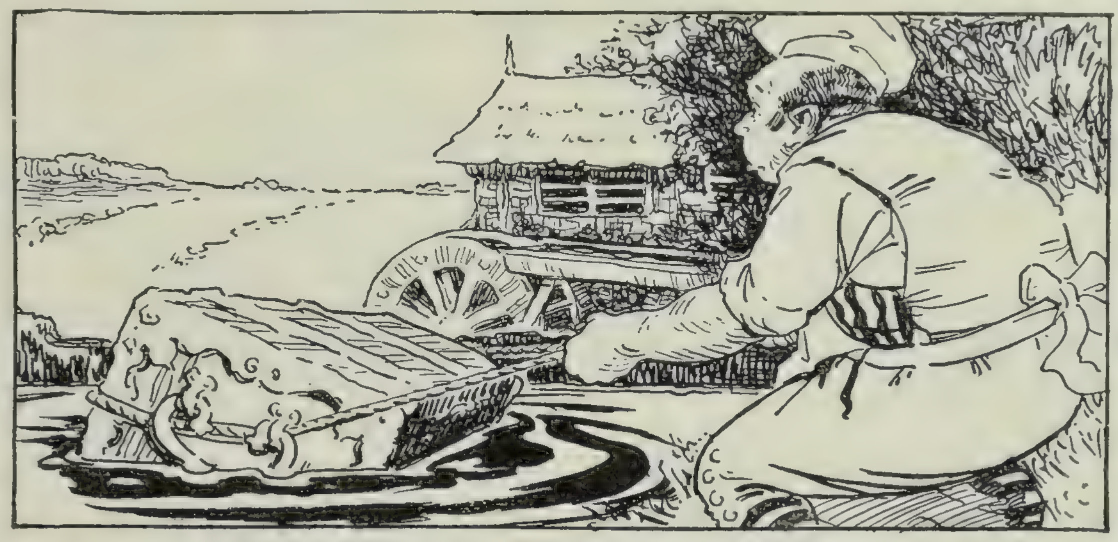
SVEND BECOMES A PAGE-BOY AND HAS MANY ADVENTURES.

The King was at that time at his court at Viborg.

" What manner of man or boy is this, whom my daughter is destined to marry ? " thought the King. " I must go and see him for myself."

So the King set forth upon a milk-white steed, and he rode on and on through the thick forest, until he came, at last, to the peasants' cottage.

The peasant and his wife were greatly surprised that the King himself should thus honour them with a visit, and when he asked to be allowed to take Svend into his household as a page-boy, they were delighted.



He towed the chest safely towards the bank.

They willingly consented to let Svend go, for they believed that what the " Man of the Mountain " had foretold was soon to come to pass.

So they said their fond farewells, and away went Svend, walking beside the King's white horse.

But alas for all their hopes ! The King intended that no such thing should happen. As soon as he arrived in Viborg he put Svend into a huge oak chest, which he had kept in readiness for him, shut down the lid, and threw the chest, with Svend inside it, into the deep river which washed his palace walls !

But good fortune favoured the boy, for the chest did not sink. Instead, it floated upon the surface of the river until it came to a mill. The miller, who happened to be opening the sluice gates, saw the chest and threw a noose about it. He towed it safely towards the bank.

When he opened the chest and saw that it held Svend, who was indeed a very beautiful boy, the miller was greatly pleased.

" At last my prayers are answered," he said. " Long have I prayed for a son of my own, and I have never had one. Now I shall keep you and bring you up as if you were my very own."

So Svend lived happily for some time as the miller's son. He helped the miller in his work at the mill, and he learned his lessons diligently and well. Every day he grew more and more handsome, and at last his fourteenth birthday came round.

On that day, the King's daughter, at Viborg disappeared from her royal father's palace ! A great hue and cry was raised. People set forth together in parties to search for the Princess, but she was never found.

The old king felt that a just punishment had befallen him for his cruelty to Svend, but he dearly loved his daughter, and he longed to see her again. So he offered a reward of half his kingdom, and his daughter's hand in marriage, to any one who would restore her to him.

In the meantime, as Svend was now fourteen years old, the wicked troll who had offered Svend's father the magic purse came to Svend's old home and demanded the boy.

SVEND'S FATHER DECLARES THAT HE DOES NOT KNOW WHERE HIS SON IS.

In vain did Svend's father declare that he knew not where to find his son. The troll said :

" If your son cannot be found, then you must come to me yourself, as I commanded you when last we met."

The poor peasant had to go with the troll, and his wife, now left all alone, went weeping from place to place. She wandered far, and at last, as luck would have it, she came to the very mill in which Svend lived. Svend was standing outside the door as she came by.

"Good woman, what ails you?" he asked.

The woman peered into his face.

"Why! If it is not my son himself, my long-lost son!" she cried joyfully.

As Svend looked at her, he remembered her too.

"Mother!" he cried.

They fell into each other's arms and kissed each other fondly.

Then when she was rested, she told Svend the sad story of how the troll had come and demanded him, and how he had taken his father instead.

Svend was horrified. He jumped to his feet.

"Rest here, mother," he said. "The kind miller has been like a father to me for all these years. He will, I am sure, take care of you too, for I must go at once to rescue my father."

"Oh, do not leave me, Svend, now that I have found you again," begged his mother. "Besides, you do not know where to find the troll, or anything about him. You might never return."

Svend laughed.

"Do not fear, mother! I am now nearly a man, and I can look after myself. I will soon find my way to the house of that troll, and if my father is still alive, I will rescue him and bring him back to you."

So saying, the brave boy set out on his journey to find the troll. He took with him the packet containing the bear's hair, the fish's scale, and the bird's feather which the "Man of the Mountain" had given to his mother.

PART III.

SVEND HIDES IN A CUPBOARD IN THE TROLL'S HOUSE

AWAY went our hero along a hot, dusty road. When he had walked far, and the sun was high in the heavens, Svend thought that he would sit down in the shade of a tree and rest awhile.

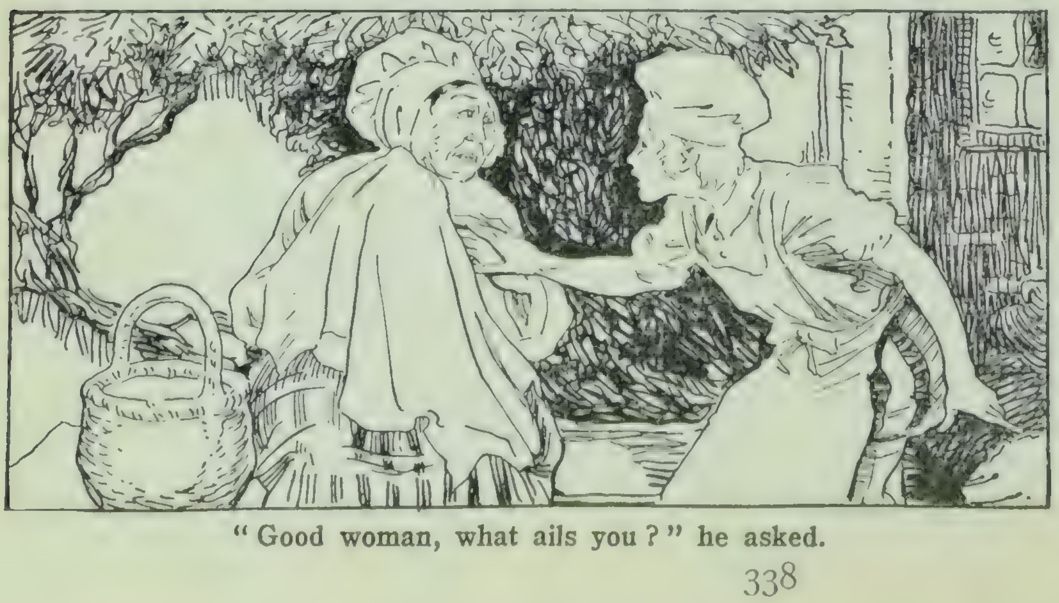
He took some bread from his pocket and began to eat it. A swarm of tiny ants soon appeared, and they began to eat the crumbs that he had dropped.

When Svend saw that some of them had not had any crumbs, he scattered a few more for them. A voice seemed to come from the ant-hill, saying, "May good luck go with thee!"

"I will need all the luck I can get," thought Svend, "for I do not even know how to begin to look for this wicked troll!"

SVEND OFFERS TO CARRY THE OLD WOMAN'S BUNDLE.

As he spoke a poor old woman passed him. She was bent with age, and she was struggling to carry a bundle of sticks.



"Good woman, what ails you?" he asked.

"Let me help you," said Svend. "My arms are younger than yours."

The old woman thanked Svend warmly, and as they walked along, Svend carrying her bundle, they chatted. Svend told her the nature of his errand, and the old woman said:

"Perhaps I can help you. I am a housekeeper to a troll who lives close by, in yonder thicket. But I do not think he can be the one you are seeking. He has not brought any man home with him, as far as I know. He has a brother. It may be he."

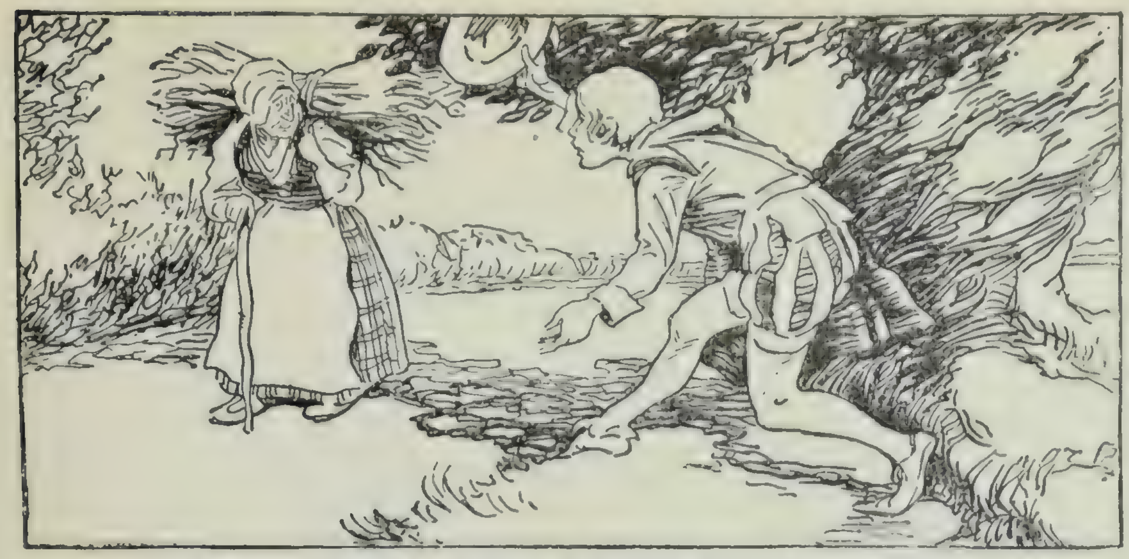
"Good," cried Svend, feeling more hopeful. "Do you think I could come into the house with you?"

"No! My master is so fierce. By day he changes himself into a great white owl, and he sits above the door, watching all who come and go. But wait here. I will see what I can do."

THE OLD WOMAN TIES SVEND UNDERNEATH THE COW.

Svend waited by the roadside, and soon the old woman returned, bringing with her a fat cow. She tied Svend underneath the cow and in that manner she was able to take him past the white owl, and round to the back door of the troll's house.

Once he was indoors, Svend hid himself in a huge cupboard, leaving the door open a little so that he could see and hear all.



A poor woman, carrying a bundle of sticks, appeared.

Soon the troll came in for his supper.

"Fee, fie, fo, fum, I think I smell a nice young man!" he roared.

"No, you don't! It is only the sheep I have cooked for your supper," said the old woman.

When the troll had eaten, and was dozing before the fire, the old woman said:

"Master! I have had such a strange dream. I dreamed that you had taken away an innocent man."

"It was not I. It was my brother. Now be quiet, woman. I wish to sleep!"

Svend, from his hiding-place, heard all this. Soon the old woman spoke again.

"Pray, where does your brother live, master?"

"Far away on Dragons' Island, which lies to the north of Jutland. By day he changes himself into a fierce dragon, and his twelve sons become twelve crows, but by night they become trolls again. Now hold thy peace, woman!"

That night, whilst the troll slept, Svend crept quietly out from the troll's house, and set off at once for Dragons' Island. He had been walking along for some time, when he suddenly remembered the packet which his mother had given him.

He opened it and pressed the bird's feather. At once the King of the Birds appeared, saying, "What is thy wish?"

Svend told him that he wished to be taken to the Dragons' Island, but the bird thought it would not be easy to get there.

"Jump upon my back," said the bird. "I will do my best."

Away they sped through the air, and soon the great bird swooped down upon Dragons' Island. But the dragon-troll saw them, and each time they tried to land, a flame of fire shot upwards and drove them back.

Then Svend thought of the fish's scale.

"Take me back to Jutland, please," he said. "I have a different plan."

When he stood again on the shores of Jutland, he pressed the scale.

At once the King of the Fishes appeared.

"Can you take me across to Dragons' Island?" asked Svend.

"Jump upon my back and hold fast," said the great fish. So Svend jumped upon the fish's back and away they sped through the water.

Soon Svend set foot upon the Dragons' Island. The dragon-troll was nowhere to be seen.

PART IV.

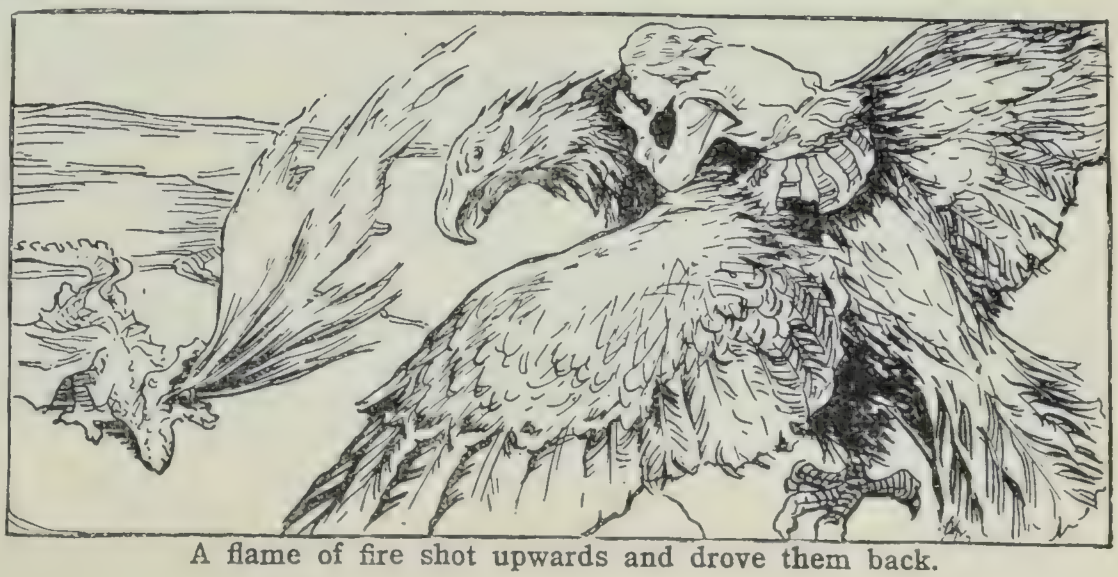
SVEND FLIES AWAY ON THE EAGLE TO ATTACK THE DRAGON

FEELING tired after his long journey, Svend decided that he would wait until the morning before attacking the dragon. So he lay down under a tree, covering himself with leaves so that he should not be seen.

As luck would have it, twelve black crows alighted on the tree above him. They were none other than the twelve sons of the dragon.

"Hm!" said one. "That boy, Svend, will never be able to land on this island!"

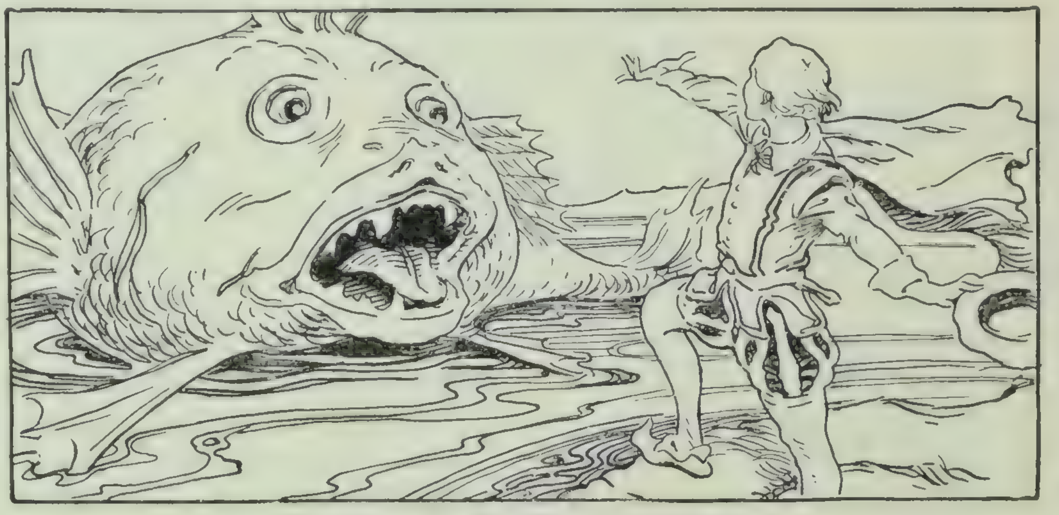
"Did you see him perched upon the eagle's back?"



A flame of fire shot upwards and drove them back.

"Yes," said another. "Even if he were to land, he does not know that nought can kill our father but the sword of the 'Man of the Mountain.'"

Then the crows all flew away. But Svend had heard all that they had said.



He called for the King of the Fishes.

At once he summoned the King of the Fishes to him.

"Take me back once more to Jutland," he commanded.

The great fish swam back with him, and then Svend pressed the bear's hair. The King of the Bears now appeared.

"Master, what is thy wish?"

"I wish to be taken to the home of the 'Man of the Mountain,' please," said Svend.

Then the King of the Bears called all the animals together, and asked them if they knew of the home of the "Man of the Mountain."

"Yes," said the hare, "I know it well. Follow me, master, and I will lead you there."

So Svend followed the hare, until he stood outside the door of the house.

"Take this glove," said the hare. "It will make you invisible. Wear it and you can slip inside when next the door is opened. The sword you seek lies just behind the door. I will await you here."

All went well. Svend wore the glove, slipped inside, and seized the sword without being seen by anybody. Then again he called for the King of the Fishes, and soon he was standing again on the shore of Dragons' Island!

The dragon-troll came to meet Svend. Flames and smoke came from his nostrils.

"Now I have you!" cried Svend, rushing forward with the magic sword.

A fierce fight followed. The ground shook, trees were uprooted, rocks and stones were hurled about, but at last the dragon was vanquished.

Svend, waving his sword in the air for joy, ran towards the castle. There he found not only his aged father, but the King's daughter as well! The dragon-troll had stolen her at the same time. Svend's joy knew no bounds. But he lost no time in taking his father and the Princess over to the mainland.

Thus was his destiny fulfilled. For, as you must have already guessed, the fair Princess became Svend's bride, the King asked Svend's pardon for the wrong he had done him, Svend's parents came together again, and they all lived happily ever after!

ANSWERS TO PROBLEMS ON PAGE 178

1. £220 in pennies; £132 in halfpennies. Ten pennies side by side in a line make exactly one foot, while twelve halfpennies cover the same length.

2. 22. The minute hand does not overtake the hour hand between 11 o'clock a.m. and twelve o'clock noon. The same applies to 11 p.m. and midnight.

3. No answer is required.

4. The figures 1234567890 are arranged thus:—

$\frac{1}{2}+\frac{38}{76}+49+50=100$.

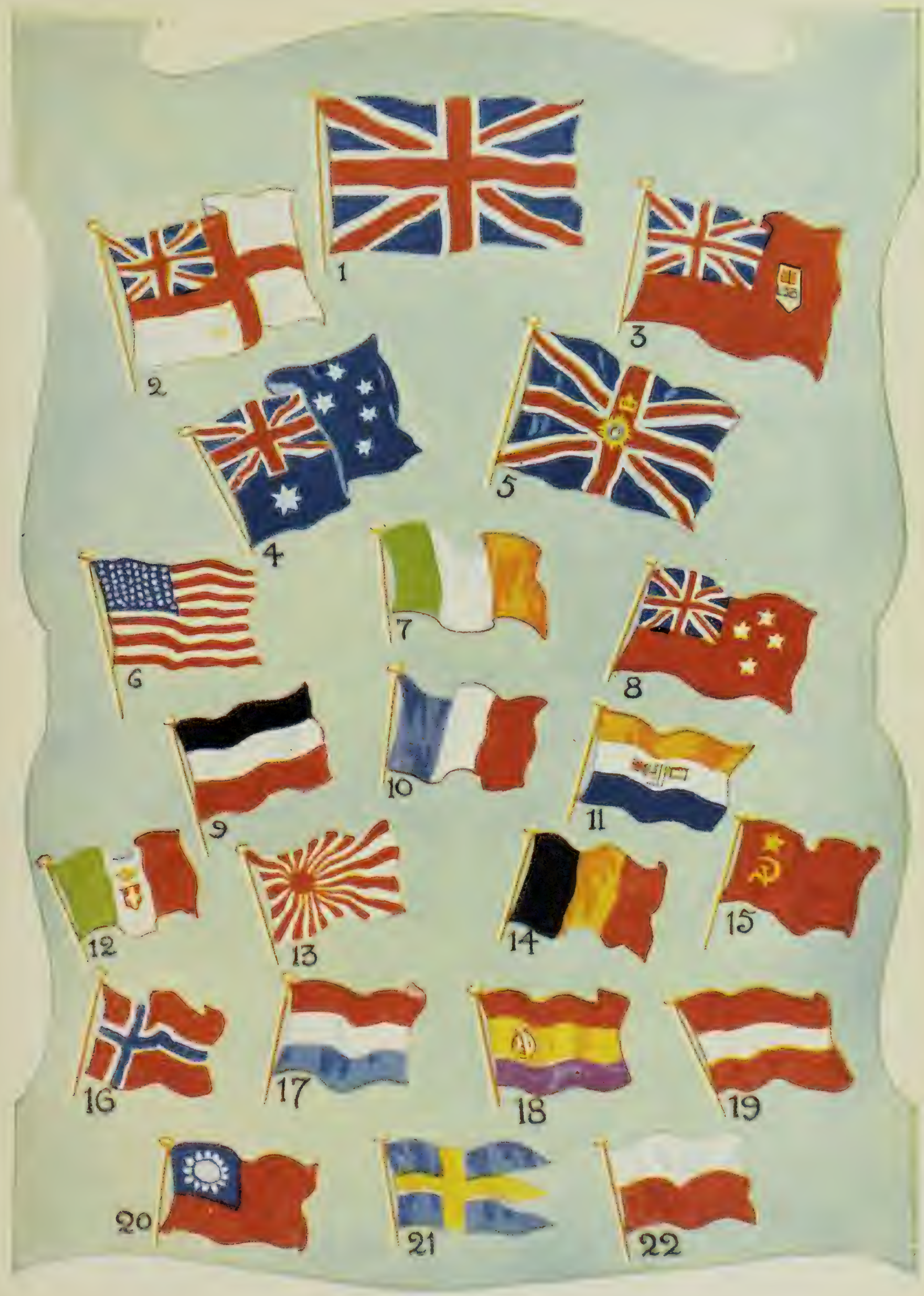
$\frac{38}{76}$ is really $\frac{1}{2}$, as you will see.

5. The square omitted is 69696, which is the square of 264. You will notice that this square reads the same backwards as forwards.

6. 67861.

7. 20 miles. The fly is flying in all exactly half an hour.

8. $13\frac{1}{5}$ seconds. The catch here is that the timing cannot begin until you hear the clock strike its first note. Thus the six seconds for striking 6 is really the time it took the clock to strike 5 times. So the time for the second six strokes will be $7\frac{1}{5}$ secs. Total$=6+7\frac{1}{5}=13\frac{1}{5}$ secs.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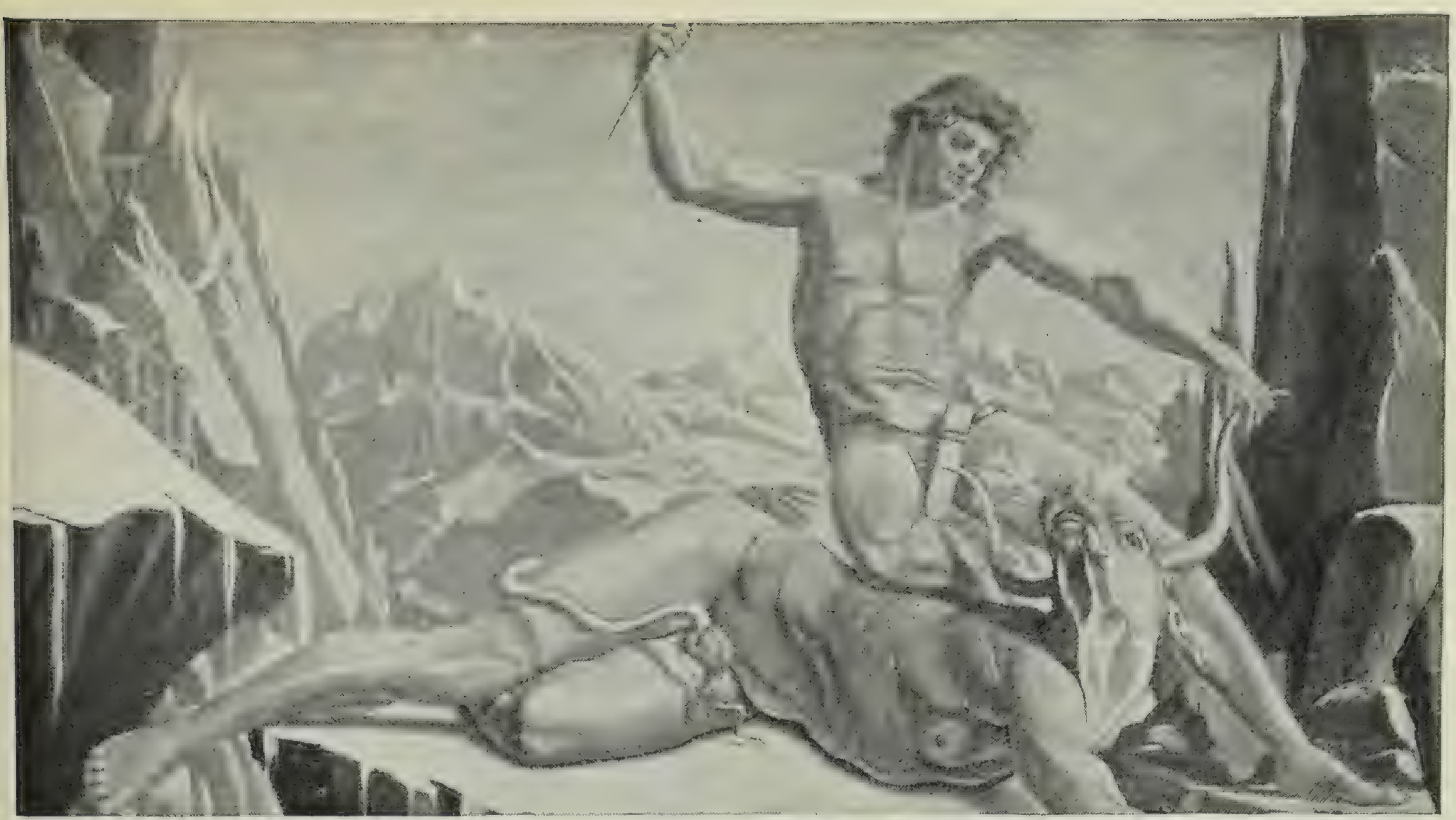
FLAGS OF THE NATIONS.

1, Great Britain—Union Jack. 2, Great Britain—White Ensign (Royal Navy). 3, Canada. 4, Australia. 5, India. 6, United States of America. 7, Irish Free State. 8, New Zealand. 9, Germany. 10, France. 11, Union of South Africa. 12, Italy. 13, Japan. 14, Belgium. 15, Russia (Union of Socialist Soviet Republics). 16, Norway. 17, Netherlands. 18, Spain. 19, Austria. 20, China. 21, Sweden. 22, Poland.

Facing page 310



Theseus slays the Minotaur after a thrilling chase through the maze or labyrinth. [*From the picture by T. E. Harrison*

SOME FAMOUS FIGHTS

Man is a born fighter, and history has shown that whenever a great cause needed a leader, that leader, man or woman, was there to answer the call. Joan of Arc led France to victory, Garibaldi united the states of Italy, while Nelson sealed the French fleet's doom and gave to Britain her mastery over the high seas. In this section it is shown that there are fights in peace quite as important and as noble as the battle-combats of nations. The stories told are taken from old legends, from true history, and from valiant struggles taking place to-day and as yet unfinished. If the reading of this selection from the hundreds of courageous struggles recorded by history teaches us anything at all, it teaches us that peaceful struggles are often of even greater value than those of war.

LONG years ago, when our old earth was still very young, there dwelt in the fair city of Athens a strong and valiant young prince named Theseus. This prince had already earned fame for himself by his deeds of daring, and it was his ambition to clear all evil things out of the land over which his father ruled, so that the people could live in happiness and peace.

Now every year, at the coming of spring, there came a herald into the market place of Athens who stood and cried aloud :

" Oh, King and people of Athens, where is your yearly tribute for my master, King Minos of hundred-citied Crete ? "

And every year the Athenians grieved bitterly, for they were obliged to send seven youths and seven maidens as tribute to King Minos, who, years before, had conquered their land. These unfortunate youths and maidens, once they arrived in Crete, were forced into a great labyrinth, there to meet the Minotaur, a terrible monster which fed on human flesh.

So when Theseus was come to manhood he thought, " Here is another evil from which I must free my land." And though his father, Ægeus, tried hard to dissuade him, he went down to the market place and offered himself as one of the seven youths who should voyage on the black-sailed ship to many-citied Crete.

His old father wept bitterly when he parted from him :

" Day by day I shall watch from the cliffs for the return of the ship. Promise me, oh, my son, that if you escape the dreadful monster and live to return safe home again, you will take down the black sails from the vessel and hoist white ones. So shall I know that my son lives."

Theseus promised, and away he and his companions sailed over the sunlit seas to Crete.

Now Minos was a great and wealthy king, and Theseus and his companions were brought before him as he sat in his marble palace on a throne of gold. But unabashed by all this splendour, Theseus stepped forward and cried :

"A boon, oh King! Let *me* be thrown first to the monster—for I came here of my own free will, so that I might meet and slay this beast."

Minos admired the youth's courage and granted him his wish; but the king's daughter Ariadne admired him too, and thought it a great pity that one so strong and handsome should go to certain death, so she stole down to his prison during the night and offered to set him free.

When he told her that he would not leave the island until he had killed the Minotaur, the maiden gave him a sword, for his own weapons had been taken from him. She also gave him a ball of thread which he could unwind secretly as he went through the labyrinth, so that he would be able to find his way back again.

The next day the guards came, led Theseus to the labyrinth and there left him.

HOW THESEUS DISCOVERED A CREATURE WITH THE BODY OF A MAN AND THE HEAD OF A BULL.

For hours Theseus wandered along the winding paths of that gloomy place; in and out of dark caverns, round great beetling rocks, over masses of boulders, this way and that he turned until all sense of direction was lost, but all the time he was paying out from his hand the thread which the fair Ariadne had given him, so he knew it would be there to guide him when he wished to return.

Then, suddenly, as he entered a narrow passage between two overhanging cliffs, he stopped short in astonishment, for there, just before him, was the strangest creature he had ever seen. This weird beast had the body of a man, the head of a bull, and the teeth of a lion, and as soon as he saw Theseus he let out a mighty roar, lowered his head and charged.

Then began the most terrific fight between this evil creature and the good Theseus.

As the beast charged, Theseus leapt nimbly aside and quickly drawing his sword wounded the creature in the knee.

HOW THESEUS IN THE END WAS SUCCESSFUL IN HIS QUEST.

The Minotaur let out a cry of pain, for never before had he felt a wound. He charged again more madly than ever and again only Theseus' nimbleness of foot saved him, but he managed to get in another cut with his sword.

And so this wild fight went on. Over and over again the creature charged, seeking to crush Theseus against the rock, or to pierce him with his great horns, and Theseus just managed to spring aside each time and deal yet another thrust on the unwieldly body of his foe.

Ever farther up the labyrinth their struggle took them and the strength of both began to fail. At last, spent and exhausted, the Minotaur sank for a moment on to the ground and in that same moment Theseus was upon him. Grasping the horns, he forced back the bull-like head and quickly drove his sword through the creature's throat.

Limping and weary, but rejoicing that he had freed the earth from such a monster, Theseus, with the aid of the thread, found his way out of the labyrinth. At the entrance he found Ariadne awaiting him and together they went softly and freed his companions.

With all haste they boarded their ship and set sail for Greece, but alas! so full were they of rejoicing that they forgot to hoist a white sail, and as they neared the land, Ægeas, who was eagerly watching for their return, saw the black-sailed ship. "My son, my son, he is dead," he cried, and in his great grief he flung himself into the sea and died.

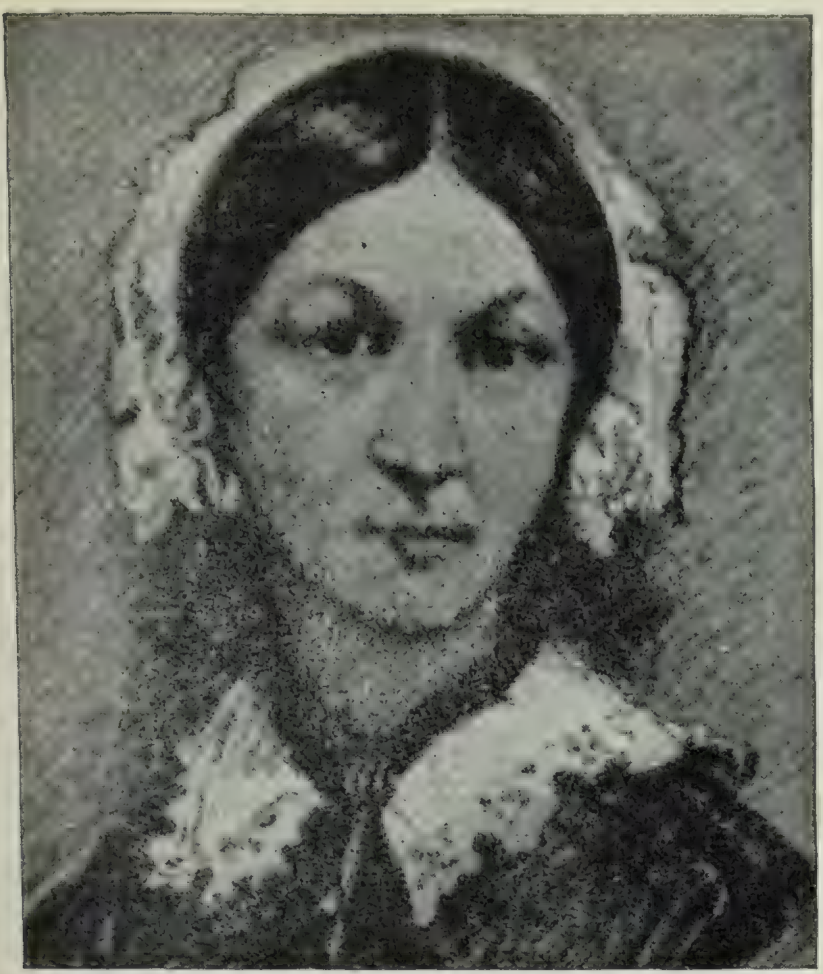
So the rejoicing of the hero was turned to sadness, but Theseus became king of Athens and ruled his country wisely and well.

WHO WAS CALLED THE "LADY WITH THE LAMP"?

WHEN Queen Victoria came to the throne in 1837, a young girl, about a year younger than the new queen, was growing up quietly in her beautiful home in Hampshire.

Florence was seventeen; she had just finished with lessons and was beginning "to take her place as the squire's daughter, visiting the sick, organising Bible Classes and interesting herself in the village people." But this did not satisfy her; neither did the parties and dances, the trips abroad, nor even the presentation at Court. As she was a healthy, happy girl, she enjoyed all these things thoroughly, but she wanted something more: she wanted to do something really useful with her life.

Her parents were horrified when she told them she wanted to become a nurse. It was unheard of in those days for a refined girl from a decent home to dream of such a thing. The few nurses there were a hundred years ago were generally ignorant old women, not too clean or particular in their habits, and Mr. and Mrs. Nightingale were shocked to think of their beautiful daughter mixing with such people.



The brave young girl who left home and spent her life fighting disease and easing the sufferings of her fellow-men.

So, for a long time, Florence was obliged to remain at home with her parents, but she never gave up her great ideal. She accompanied her mother to London and other places, but whenever she could she visited the workhouses, hospitals and nursing institutions in whichever city they happened to be staying. And so she gained, in the face of much opposition, some knowledge of nursing, and when she was about thirty-four, her parents grudgingly allowed her to become the superintendent of a small nursing home.

This was not all that she had longed for, but it was a beginning, and she made the most of it; so that when a year later her great opportunity came, she was ready to seize it.

HOW FLORENCE NIGHTINGALE DECIDED TO GO TO THE CRIMEA.

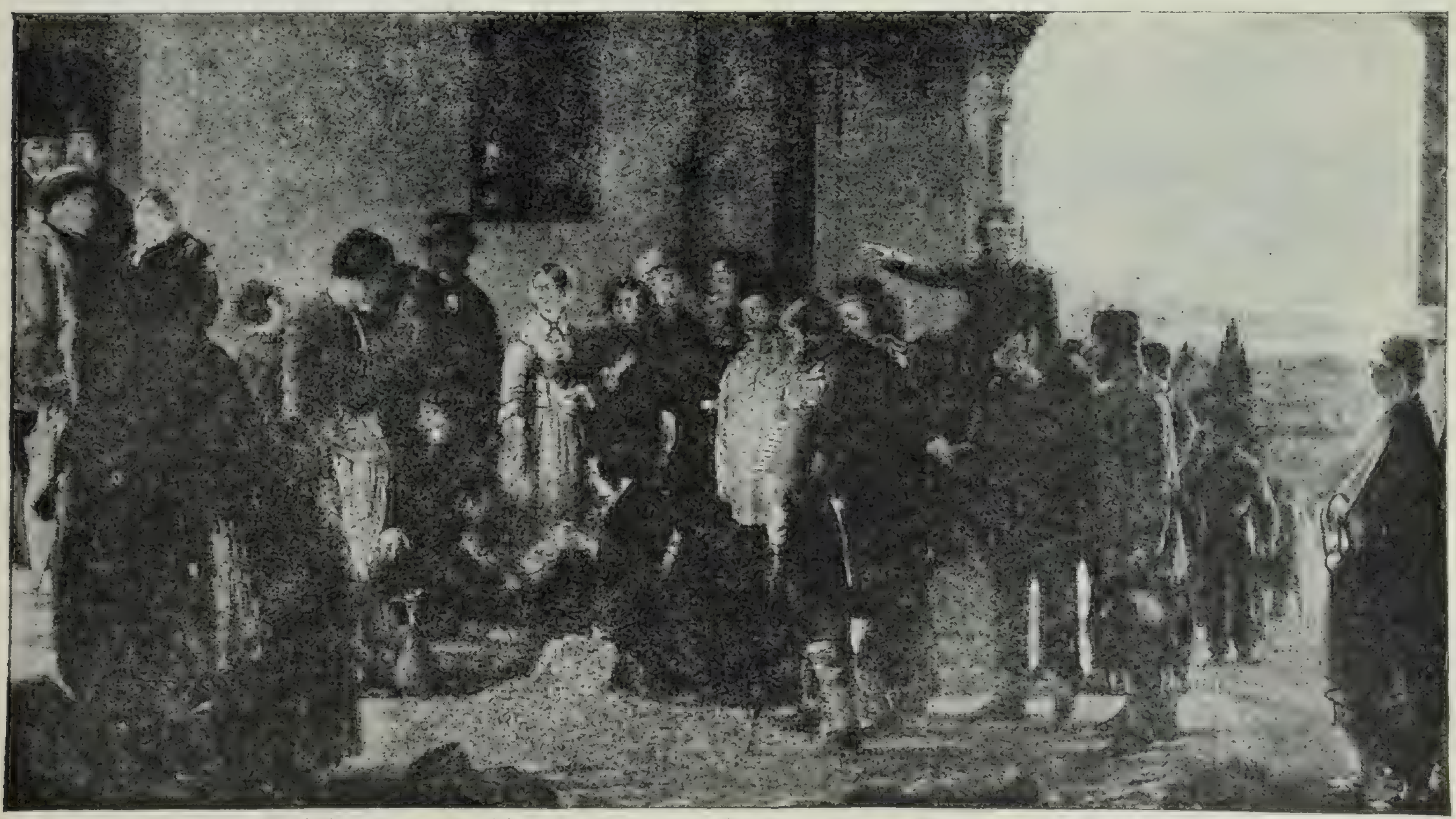
In 1854 the Crimean War broke out; the British and French went to the help of Turkey in her struggle against Russia.

Thousands of our men were rushed out to the Crimea for what those in authority said would be but a short, sharp fight. But when the winter came on the war was not over and the men suffered terribly in the severe cold.

Reports reached England that thousands of men were dying, not in battle, but through cold and lack of attention when they were wounded, for there were very few doctors to attend to all the men, and no nurses ever went out with an army in those days.

Miss Nightingale heard of all this distress, and she longed to help the poor fellows who were lying sick and wounded with no one to attend to them. Why should she not go out and look after them?

Such a thing as women in an army hospital had never been heard of, and so, of course, she again met a great deal of opposition. But she stuck to her point, and at last the government agreed to let Florence Nightingale and a party of thirty-eight nurses go to the Crimea.



At Scutari, Florence Nightingale worked heroically to save the lives of the sufferers and to bring order into the hospitals.

THE BRAVE GIRL WHO SOOTHED THE SUFFERINGS OF THE WOUNDED.

And what terrible conditions she discovered when she arrived.

At Scutari, the headquarters, an old tumble-down building was used as a hospital. Its walls were thick with dirt and its floors so rotten that they could not be scrubbed. It was crowded with sick and wounded. There was no ventilation and the beds were so close together that one could hardly move, while the cooking and washing arrangements were indescribable.

Miss Nightingale was appalled, but she quickly got to work, and though she was opposed by the older doctors and officers, who all objected to any change, she soon obtained some kind of cleanliness and order.

HOW FLORENCE BECAME POPULAR WITH HER SOLDIER-PATIENTS.

She and her nurses worked heroically. There were four miles of beds in that vast hospital, but Florence Nightingale always managed to be where she was most needed, and her courage and skill saved the life of many a man whose case the doctors had declared hopeless. The men looked for her coming and almost worshipped her as she passed among them, tending them with a gentleness and sympathy which were often as good as any medicine.

In addition to all this, she wrote their letters for them, if they were too sick to do it for themselves ; she provided reading and recreation rooms for the convalescents, and arranged to bank their money or to send it home for them if they wished.

In these and other ways she did a great deal to improve the conditions under which the soldiers on active service had to live, and when she returned home she worked just as hard for many years, for she was determined to make it impossible for such a state of things as she had found at Scutari ever to occur again.

Though she herself was suffering from the strain of her life in the Crimea, she worked hard for years against the opposition of those in authority, until at last she forced them to remodel the barracks and the army hospitals, so that the number of deaths due to poor food and inefficient nursing gradually decreased by half.

HOW SHE EARNED THE TITLE OF "THE LADY WITH THE LAMP."

But her work was not only for the soldiers. A large sum of money was collected by the nation as some recognition of her work in the Crimea, but she would not accept it for herself. She spent it on a large hospital and nurses' home where nurses could be properly trained for their difficult work.

AT LVX
FLORENCE
NIGHTINGALE
1820-1910

Florence Nightingale's statue at Derby. This Queen of Nurses is seen holding a light above a suffering world.

And so to-day we have to thank Florence Nightingale, the Lady with the Lamp, for the splendid body of nurses who are ever ready to help the doctors in their fight against disease and death. She was a ray of sunshine to those in pain and near unto death. On her statue at Derby are the two Latin words "Fiat lux,"—"Let there be light,"—truly a fitting expression of her life's work.

MEN WHO HAVE CONQUERED THE DESERT

SINCE the very early days of civilisation, men have had the idea of making water flow where it never flowed before. In their effort to make Nature serve their needs they cut big ditches into which the water from river or sea could be taken where it was most needed either for irrigation or for navigation.

As early as five hundred years before Christ the Chinese had begun to construct their Grand Canal which, when it was finished, was over a thousand miles in length, and by 2,000 B.C., the Egyptians had cut a canal to join the Nile and the Red Sea. Since that time many thousands of miles have been cut all over the world.

HOW A CANAL CAN BE CUT THROUGH THE DESERT.

The cutting of canals is not the simple business it appears to be. There are all kinds of difficulties to be faced, difficulties which only the greatest skill of clever engineers can overcome.

When, in 1755, the Duke of Bridgwater talked of having a canal cut to connect his coal mines at Worsley with the growing town of Manchester, seven miles away, people who always scoff at things they do not understand laughed scornfully and asked how he thought he was going to get his canal across the River Irwell. James Brindley was engaged to undertake the work, and he successfully carried his canal over the river by means of a high bridge or aqueduct, to the great astonishment of the scoffers.

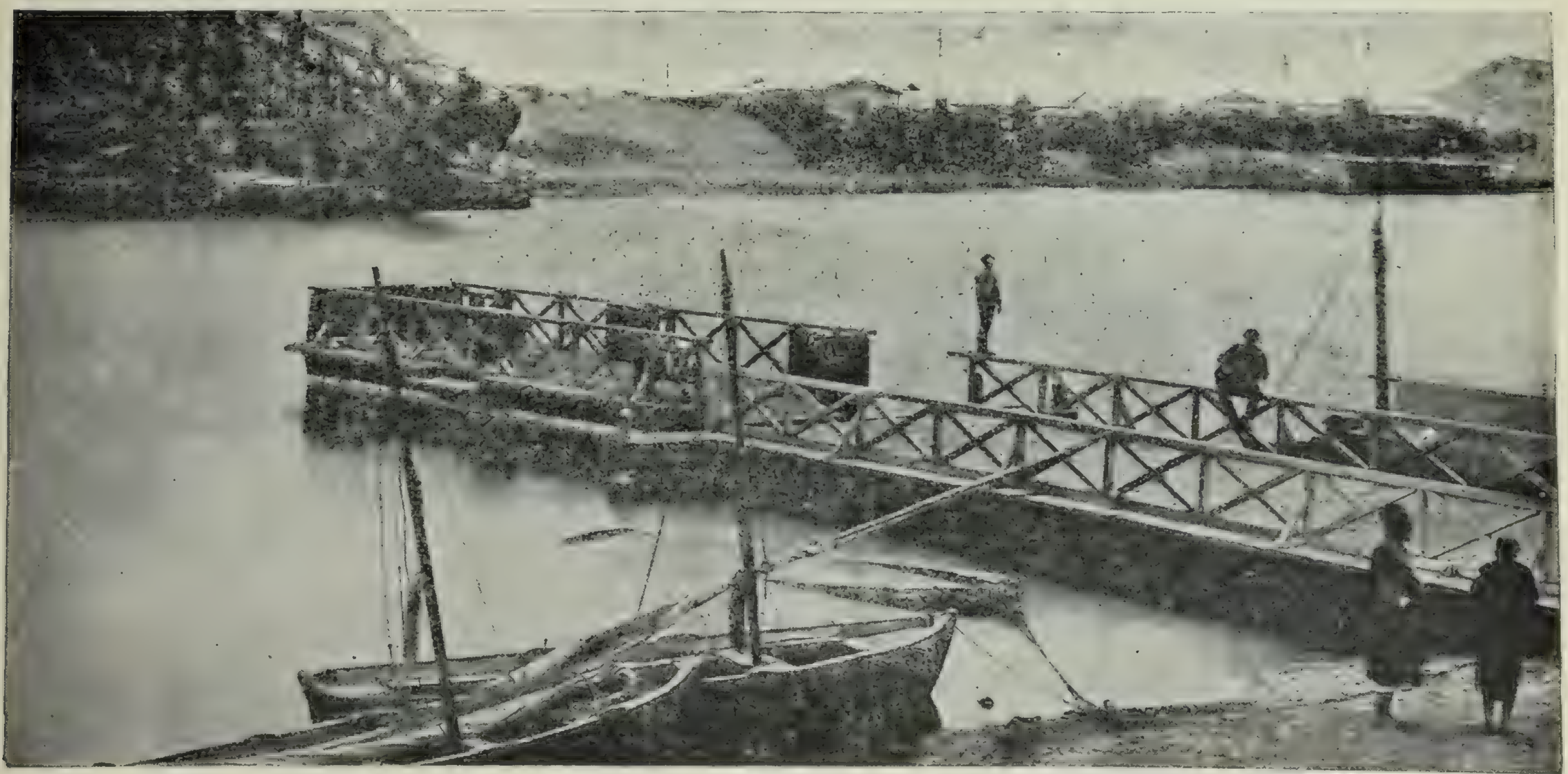
Another great difficulty which canal builders have to face is the unequal level of the land, for in very few places is the earth quite flat for many miles, and water will not flow uphill. Yet Brindley and other engineers have carried their canals up hill and down dale. This they have done by means of carefully constructed locks, each of which has to be planned individually to suit the lie of the land in that particular place.

When Ferdinand de Lesseps conceived the idea of piercing the isthmus of Suez with a canal which would shorten considerably the voyage to India, Australia and the Far East, he had many obstacles to overcome, the worst of which, perhaps, were the discouragement and opposition which met him on every hand.

A huge undertaking of this sort of course requires a tremendous amount of money, and for a long time no one had sufficient confidence in de Lesseps and his plan to lend him the money. The British government in particular was very much opposed to the scheme.

HOW DE LESSEPS HAD TO STRUGGLE BEFORE HIS PLAN SUCCEEDED.

In the first place, they said, the thing is impossible. One cannot cut a canal through the shifting sands of a desert. Why, the channel will be filled in by the falling and blowing sand as fast as you can make it! And besides, such a waterway, if it were made, would certainly weaken Britain's hold on India and the East. So de Lesseps obtained



A view of the Suez Canal. After overcoming many difficulties, de Lesseps succeeded in building this great canal through the barren desert, and surprised the men who had mocked at his scheme.

Before the great Panama Canal was cut the country was infested with malaria. The picture shows this infested area before the excavation of the canal bed, which was planned by de Lesseps, who built the Suez Canal. The first attempt, owing to fianancial troubles, was a failure.

neither help nor encouragement from that quarter.

But for two years he worked, and at last he obtained enough money from France and Egypt to enable him to make a start.

He drew up his plans carefully and they were passed by some of the most skilful engineers. Then he got to work and for ten years he carried on his struggle with the desert. Sometimes he almost despaired, for the cutting through that soft yielding sand was most difficult to make.

There was a slight difference in the level of the ground, but it was so slight that de Lesseps got over that difficulty without the use of locks. But several times, as the men excavated, the sides fell in and the channel became silted up and all the work had to be done again.

But de Lesseps never despaired, nor did he allow any obstacle to stand in his way, and at last his perseverance was rewarded with success.

In 1869 the Suez Canal was opened, and sixty-eight vessels, the first one carrying the Empress Eugénie of France, sailed slowly along the new waterway.

De Lesseps' victory, not only over the desert, but over those who had scoffed at his idea, was complete when in 1875 the British Government offered to buy the greater part of the Suez Canal, so important had it become even in that short time as the chief route to the East.

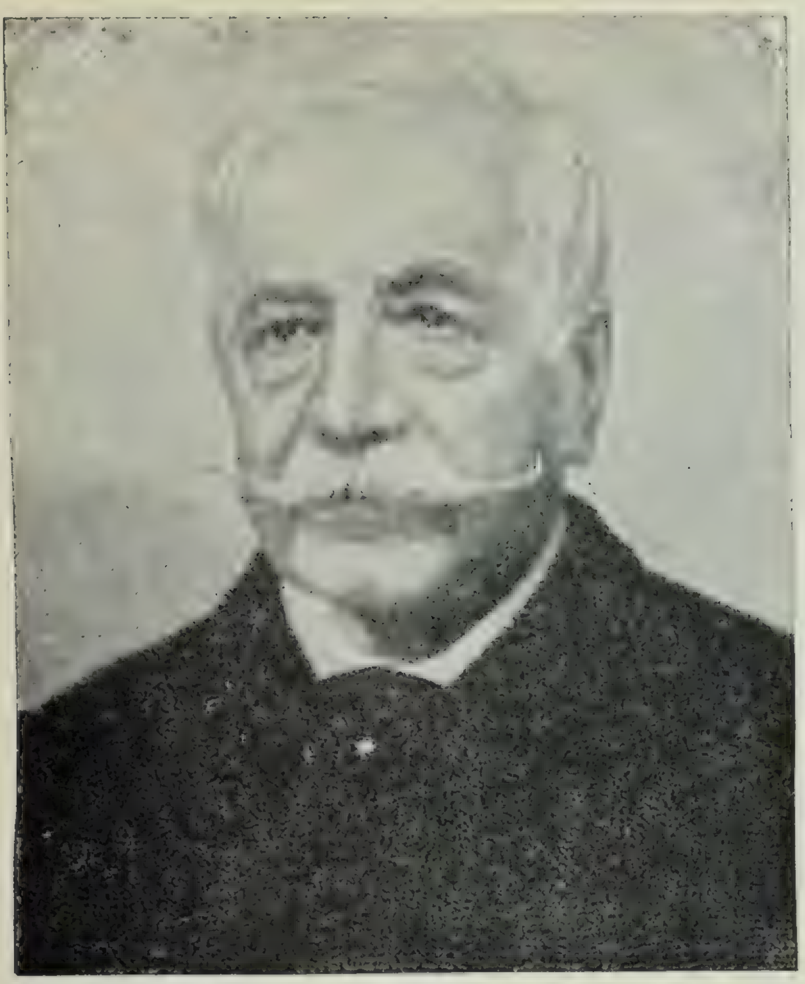
In this way, de Lesseps' perseverance and determination won the day and his long years of struggle were crowned with success. He had tamed the barren desert and showed the power of man's inventive brain.

HOW DISEASE HINDERED THE BUILDERS OF THE PANAMA CANAL.

On this page are two photographs showing another great canal, that cut through the isthmus of Panama, to cut the New World in two. These photographs are placed here for two reasons: they remind us of the last heroic struggle of de Lesseps, and they lead us to our next great fighter, Sir Ronald Ross. In what way does the Panama Canal link up these two brave men?

After the Suez Canal had proved itself such a wonderful success, de Lesseps was asked to plan a canal across the narrowest part of Central America. At this time he was over

A view of the Gatun Locks on the Panama Canal, which is one of the most wonderful waterways in the world. Many workers died of malaria during the building of this great canal.



Ferdinand de Lesseps, the builder of the Suez Canal, that opened up a shorter sea-road by way of Egypt to the East.

seventy years old, but he went out to Panama, looked over the land and made out his scheme. He saw two great barriers, the Culebra watershed of hills and the river Chagres. He planned out his canal to start at Colon and go across the Chagres valley and over a low part of the hills. The canal was to be a sea level waterway—and here was the great mistake. The river Chagres was often a torrent, and the cutting through the hills was a terrible task. The work was at last begun, but the task was found too great, and in the end the company struggling with this region of swamp, mountain and rushing torrent went bankrupt. The work was abandoned, and an inquiry was set up as to its failure. Poor de Lesseps was charged with negligence, but his son, who had assisted him, nobly tried to take all the blame on himself. Soon after this the great engineer who shortened the way to the east died, a broken man, but he left behind him a work worthy of his honourable and devoted life.

When the work on the Panama Canal was at last recommenced it was found that another difficulty was added to those of mountain and river. The workers died off like flies, of the terrible yellow fever and of malaria. It was at last due to the work of Sir Ronald Ross and other scientists that the trouble was cleared up. It was found that yellow fever and malaria both came from the bites of the mosquito. Now mosquitoes live in hot, swampy lands, and Sir Ronald Ross and his fellow workers found that the disease was carried by microbes that lived in the bodies of mosquitoes, and passed to human beings by bites from these insects. Therefore, said they, we must wipe out the mosquito if the work is to proceed. They further found that this insect lived its baby life on the surfaces of stagnant pools and in the swamps and marshes. The larvæ of the mosquito lay on the surface of the water, in order to breathe. The pools were covered with a film of petroleum, and this suffocated the larvæ, or young of the mosquito. Thus was the yellow fever stamped out, and the canal was at last built. Now we turn to read of Sir Ronald Ross and the part he played in the fight against tropical diseases.

THE MAN WHO FOUND THE CAUSE OF MALARIA

ALL through the ages men have tried to battle against disease, but it was not until the nineteenth century that clever scientists discovered that the worst enemies mankind had to face were the little germs or bacteria which are present all around us, in the air we breathe, in the food we eat, on everything we touch.

These germs are so very tiny that about a thousand of them can be placed on a pin head, and some of them are quite useful, for without them we could not make vinegar or wine, butter or cheese, but others are so very deadly that they will kill off hundreds of people in a very short time.

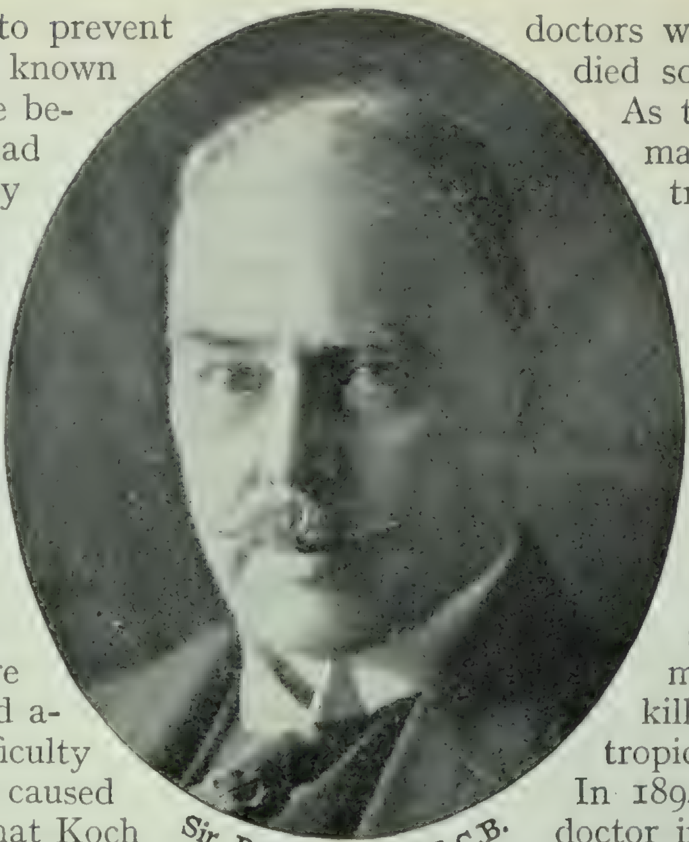
Robert Koch, a German scientist, was the first man to discover that certain diseases were caused by germs. He tracked down the germ which caused anthrax in sheep and cattle, and later he discovered the germs which caused cholera and tuberculosis.

A short time after Koch's discovery, Louis Pasteur, who had been experimenting for many years, proved that germs set up certain poisons or toxins in the body, and he declared that people could be safeguarded against the disease if an " anti-toxin," which is a weak solution of the same germ, were injected into the blood.

This was the same idea which Jenner had had many years before when he started to inject vaccine, that is, a weak solution of cowpox into the blood to prevent smallpox. Jenner had known little or nothing about the behaviour of germs; he had arrived at his results by careful observation and experiment, and in the case of smallpox his vaccination, as it was called, had been very successful.

Very thrilling and exciting is this tracking down of man's most deadly foes, and it demands a tremendous amount of courage, perseverance and skill. There are so many germs in and around us that the first difficulty was to discover which germ caused which disease. This was what Koch and Pasteur succeeded in doing. They were able to recognise the germs which were causing the mischief in the human body and so could fight and in many cases overcome them.

The next step in this great battle was to try not only to cure the disease, but to prevent it, by keeping the germs away from the body. And to do this it was necessary to find out how these germs were carried. Many men have given their lives in this endeavour to track the enemy to his lair, and one of the most heroic and successful of these brave doctors was Sir Ronald Ross, who died so recently as 1932.


Sir Ronald Ross, K.C.B.

As the years went by a good many disease germs were tracked down; some, it was proved, entered our bodies through the food we ate or the water we drank. The Plague of which we hear so much in history was carried by fleas from diseased rats.

But there was one disease which baffled all the scientists, and that was malaria, a disease which killed thousands of people in tropical countries every year. In 1894, Major Ronald Ross, a doctor in the Indian Medical Service, returned home to London and there had a long conversation with Sir Patrick Manson, who had discovered that a certain disease known as elephantiasis was carried by mosquitoes.

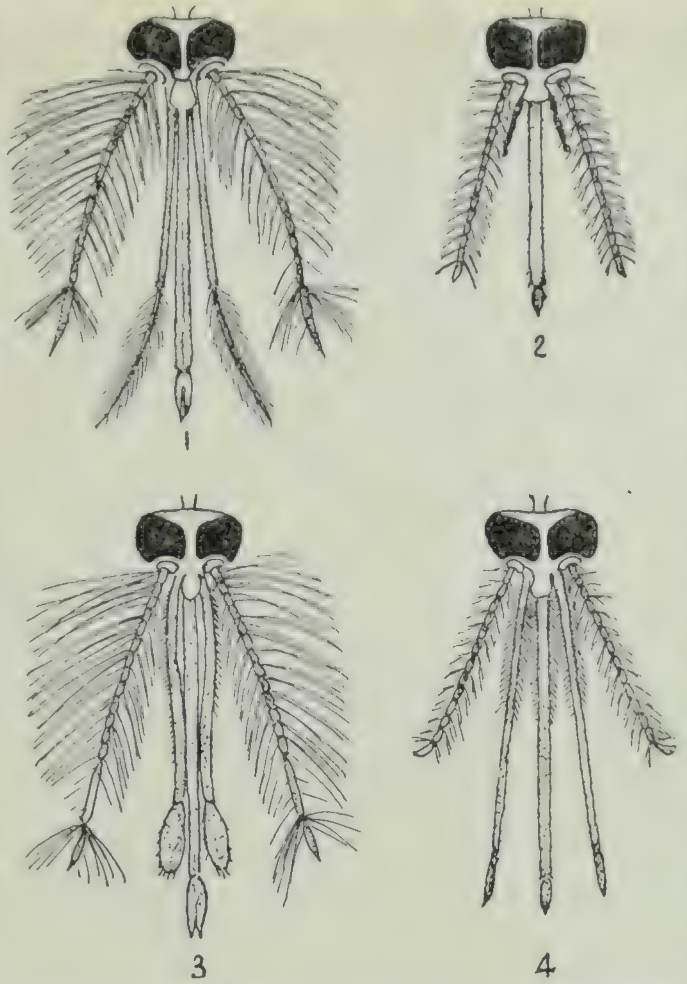
Both Ross and Manson thought it possible that malaria was also carried by mosquitoes, so Ross arranged that when he went back to India he would try to find out how this happened.

Then began a long struggle to wrest the secret of how it worked from this deadly insect.

A mosquito-infested river, showing the actual breeding places of malarial mosquitoes on the Crocodile River in the Eastern Transvaal. Sir Ronald Ross experimented to discover how disease was carried by these insects.

Month after month Ross laboured, dissecting the bodies of hundreds of these tiny insects in which he hoped to find the malaria germ. For a long time his experiments all failed, but he persevered, for he was sure that he was on the right track.

At first he thought that people contracted the disease of malaria by drinking water which had been infected by the insects, but soon he proved that this was not so. The disease then must be passed on by the bite of the mosquito, he thought, but in none of those he had examined could he find any malaria germs. But still he struggled on.



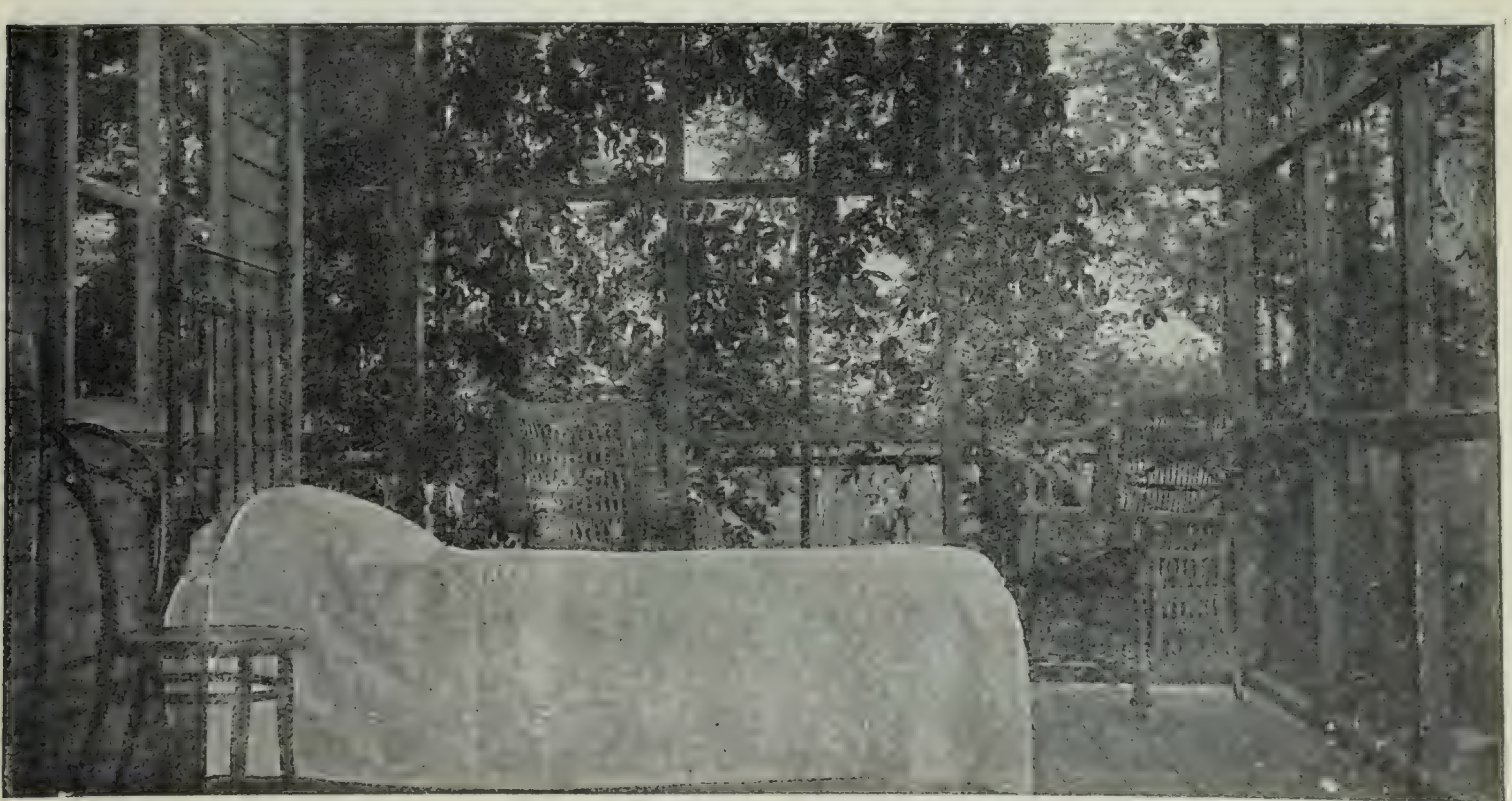
The heads of mosquitoes ; (1) male common mosquito : (2) female common mosquito : (3) male malarial mosquito : (4) the deadly female malarial mosquito with long feelers.

"At first I toiled comfortably," he wrote, "but as failure followed failure, I became exasperated, and worked until I could hardly see my way home. Well do I remember that dark hot little office in the hospital, with the necessary gleam of light coming in from under the eaves of the veranda. The screws of my microscope were rusted with sweat from my forehead and hands, and its last remaining eye-piece was cracked."

At last in 1897 success rewarded his efforts. A different type of mosquito from those he had been examining was brought to him, and there, sure enough, in the little creature's stomach, he discovered twelve living, active malaria germs.

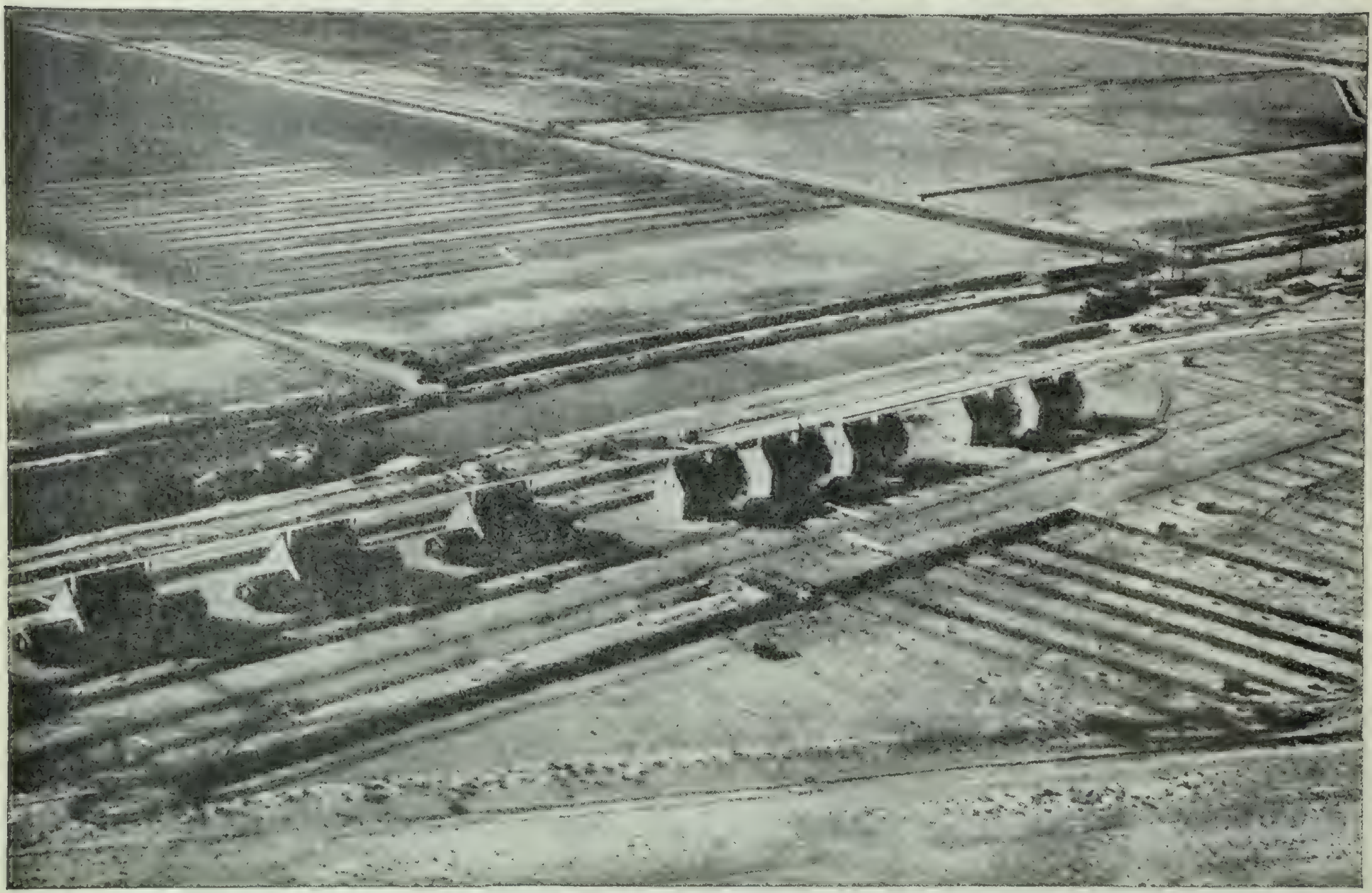
The great fight was nearing its end, the victory was in sight. Ronald Ross had discovered the carrier of the malaria germ, the originator of the dread disease. A few more experiments followed and then this great news was given to the world, and the doctors with this knowledge in their possession were able to fight the disease, and to save thousands of lives every year. Quinine is prescribed as the cure for malaria, and now Europeans in hot damp countries are never without this certain remedy.

Sir Ronald Ross became director of the Ross Institute for Tropical Diseases at Putney, and gave the rest of his life to the work which made him famous.

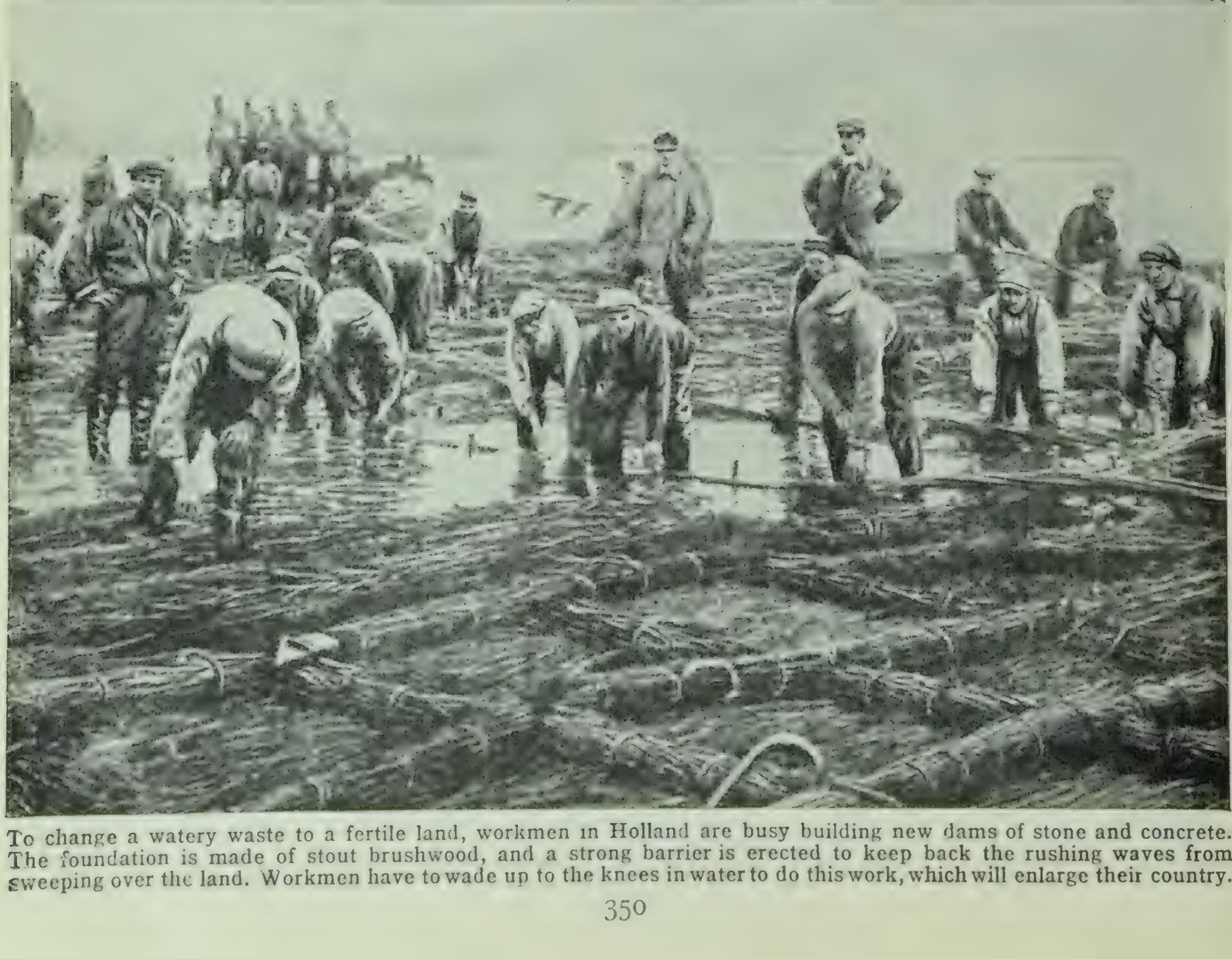


During his campaign against malaria in East Africa, Sir Ronald Ross had a mosquitc-proof bedroom in his veranda. The plague was so deadly that the lives of all were in danger.

FERTILE FIELDS ARE STOLEN FROM THE SEA



New villages are springing up on the flat ground which was swamped by the sea, and neat little cottages stand snugly where the waves used to splash in bygone days. Fresh-water canals are cut through the polder—or new land—which promises to be very rich and fertile. It is still seamed with marks of the waves, but this will wear off through time.



To change a watery waste to a fertile land, workmen in Holland are busy building new dams of stone and concrete. The foundation is made of stout brushwood, and a strong barrier is erected to keep back the rushing waves from sweeping over the land. Workmen have to wade up to the knees in water to do this work, which will enlarge their country.

HOW THE DUTCH ARE FIGHTING THE SEA

THE brave little country of Holland has had to fight for its very existence against the power of the mighty ocean.

The country, consisting chiefly of the deltas of three great rivers, the Rhine, the Meuse and the Schelde, lies in many parts below the level of the sea, and has to be protected by dykes and dunes from the inrush of the all-powerful waters.

HOW DO THE DUTCH KEEP BACK THE ZUIDER ZEE?

From time to time the ocean has showed the Dutch people what a formidable foe they have to contend against. In 1277 there was a tremendous flood which destroyed over thirty villages, and again, in 1421, seventy-two villages were destroyed, 100,000 lives were lost and a rich agricultural district turned into a reedy marsh.

Reclaiming the Zuider Zee. The workmen are laying a foundation for the concrete, sand and earth being put over the brushwood. This forms a sturdy barrier against the hungry sea which creeps over their land.

In addition to these great inundations there was a gradual sinking of the land and encroachment of the sea, until what had formerly been a small inland lake in the heart of a pleasant country was turned into a great shallow bay, eighty miles long and forty-five miles wide in some parts. Thus was the Zuider Zee formed and the little country robbed of all those miles of fertile land which it could ill spare.

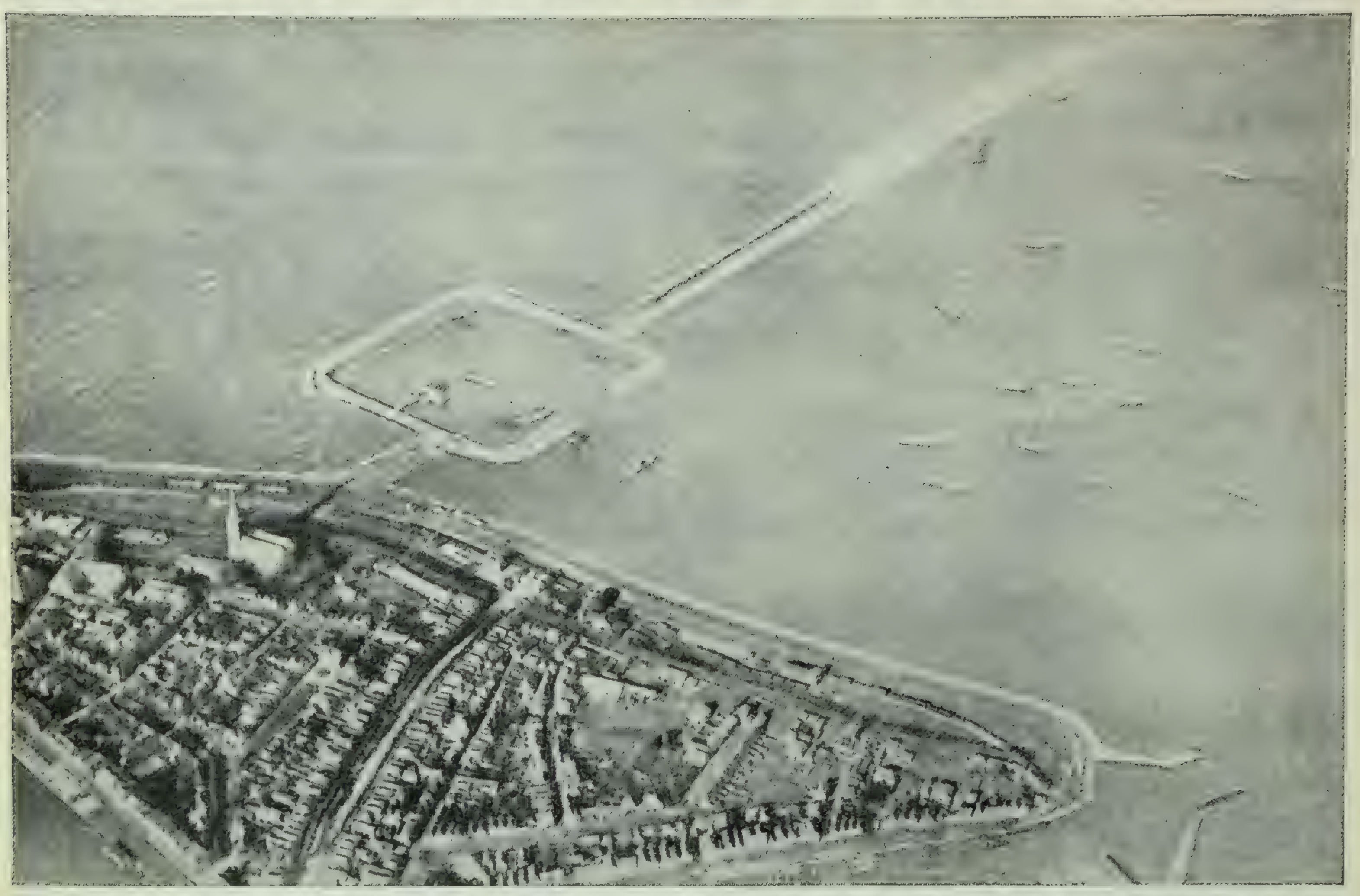
But the people determined that the sea should steal no more of their land, so they built strong dykes which would withstand the fiercest storms, not only along the sea coast but along the banks of the rivers also. Then they built hundreds of windmills to pump the water from the low-lying fields, and they cut thousands of miles of canals to drain off the surplus water and carry it back to the sea. All this meant a great display of energy and resourcefulness, for the sea is a tireless, never-resting foe, and if he finds one smallest chink in the armour of his opponent the constant trickle of even his quietest waters will quickly enlarge that gap, till he can rush in in full force, carrying death and destruction in his wake.

But the Dutch people are now not content to throw up a bulwark against their foe. They are enlisting the resources of modern science not only to keep the foe at bay; they are going out to assault the enemy in his own realm, determined to win back from him the lands he took from them so many hundreds of years ago.

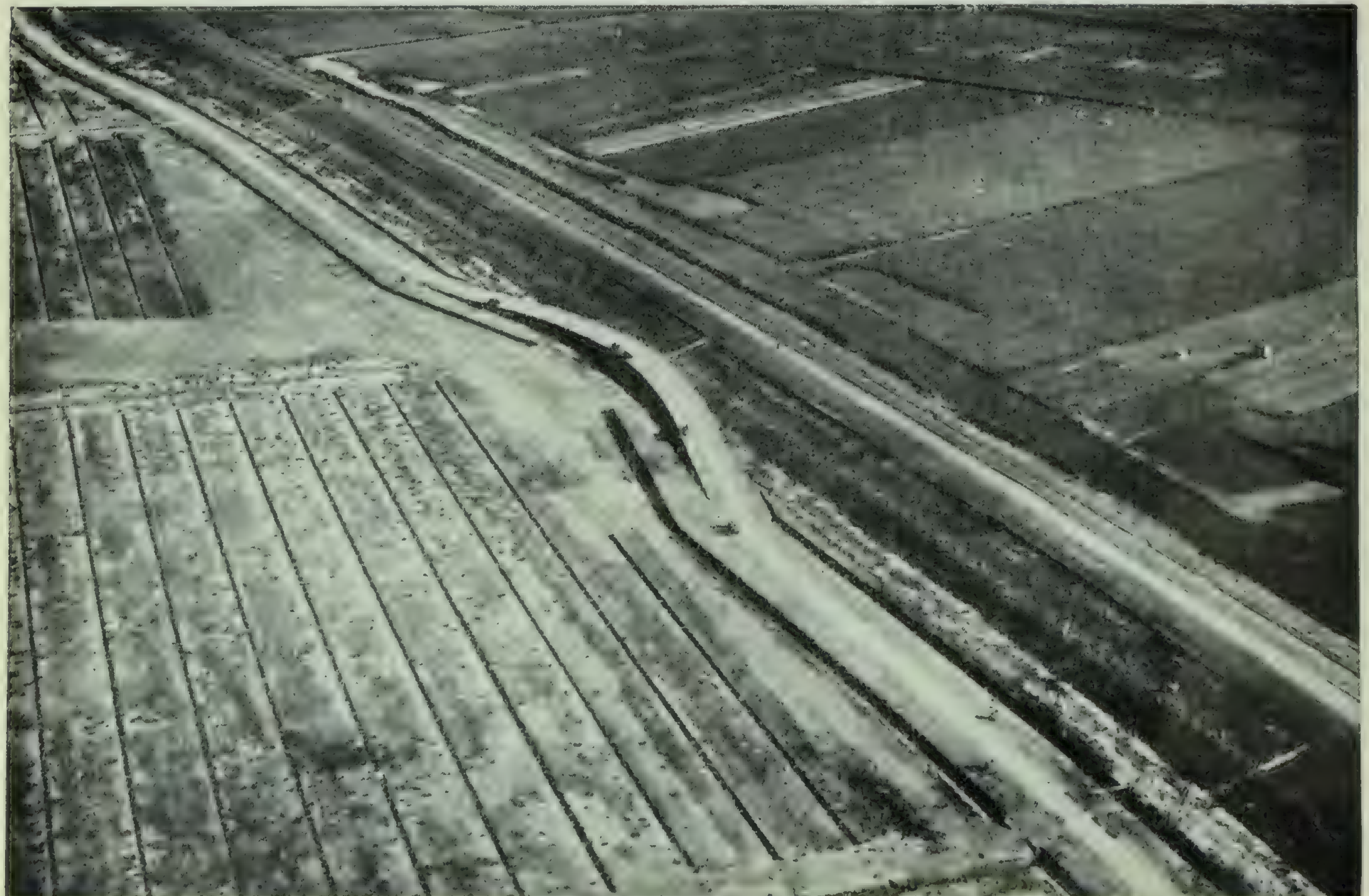
HOW THE PEOPLE OF HOLLAND SCHEMED TO ENLARGE THEIR COUNTRY.

First they determined to drain the great Haarlem Lake. To do this they employed three engines, which could pump water at the rate of 1,000,000 tons every twenty-four hours. These great engines were kept at work constantly for four years before the waters were

HOW THE ZUIDER ZEE IS KEPT AT BAY



The Dutch are reclaiming their land by building great dams and new dykes to keep the hungry Zuider Zee at bay. This aero view shows the new harbour and the mole, or barrier, in process of construction. The new land on the left is reclaimed and, when the water has been drained off, will be fertilsed so that crops can be grown.



The old dyke in the centre used to mark the edge of the seashore, but to-day the land on the left has been drained so that it can be cultivated and yield crops. The Dutch are hoping that 300,000 acres of new ground will be added to their country in this way, and that this scheme will make their land more prosperous in the future.

conquered and cultivation could begin. But even then the pumps had to be kept constantly at work, for, like a surly foe, the waters were ever lurking in the background, ready to rush in once more if the vigilance of the defenders relaxed for a moment.

This assault satisfactorily carried out, the Dutch then turned their attention to the Zuider Zee, which has an area about twenty times greater than that of Haarlem Lake.

In 1918 it was decided to start draining part of the Zuider Zee. The work was started in 1924 and it is expected to take about fifteen years. The first thing to be done was to construct a great dyke nearly nineteen miles in length. The next step was the dyking and draining of four polders—this is the name given to the reclaimed land—which will cover an area of over 820 square miles. A large lake, the Yssel, will be left in the middle of these polders to act as a reservoir, into which the waters can be drained.

HOW HORATIUS BECAME A GREAT HERO

IN the brave days of old, long before Rome became the Mistress of the World, that city was governed by a line of Etruscan kings called the Tarquins, who ruled very badly and were guilty of many evil deeds.

At last the people of Rome determined to stand their wickedness no longer. They rose against the royal house, drove them from the city and declared a republic.

But the Tarquins worked quickly and secretly until they had gathered a big army together, then under a great leader, Lars Porsena, they marched towards Rome, determined to recapture the city.

Swiftly they advanced. They had taken the outer fort of Janiculum and were marching down to the bridge across the River Tiber almost before the Romans realised their danger.

When they did so, they rushed down to the river, for they knew that if the enemy once crossed that bridge, they would certainly take the city.

HORATIUS TAKES UP HIS POSITION AT THE BRIDGE, AND BEGINS HIS BRAVE FIGHT.

"The bridge must come down," declared the Consul. And every one got busily to work with hatchets and axes. But they worked with despair in their hearts, for they knew that the enemy would be upon them before the bridge could be destroyed.

Then one of the captains, named Horatius, had a great idea.

"Go on with your work," he cried, "do not despair. On that narrow bridge three bold men could hold thousands at bay. Who will join me in this fight against fearful odds for the sake of our beloved city?"

Two other brave men, Spurius Lartius and Herminius, at once sprang forward, and the three took up their position on the end of the bridge farthest from the city.

And as the enemy, their flags flying, their spears flashing in the sunlight, advanced towards the head of the bridge, they roared with laughter to see three solitary men trying to bar the progress of their mighty host, but their mirth soon turned to astonishment, then to wonder and admiration, and then to fear.

For then began a tremendous hand to hand fight. As Horatius had foreseen, only three of the enemy could approach at once, so narrow was the way. The first three our heroes despatched in a very short time; three more came to take their places, and they, too, were hurled into the rushing stream below.

HOW HORATIUS WAS SWEPT INTO THE FLOODED RIVER TIBER.

Then there was a moment's pause, for no one else was anxious to rush out on to the swords of the valiant three.

At last a great warrior named Astur strode forward, and lifting up his huge broadsword in both hands, he rushed at Horatius.

It needed all Horatius' skill with sword and shield to guard his head from that terrible blow. He managed to turn it from his helm, but the sweeping sword cut through his side with such a ghastly wound that for a moment he reeled and had to lean on Herminius. He quickly recovered himself, however, and rushing at the mighty Astur he ran him through with his sword. Then, placing his foot on the dead champion's body, he called: "Who next tastes our Roman cheer?"

But no one answered his haughty challenge.

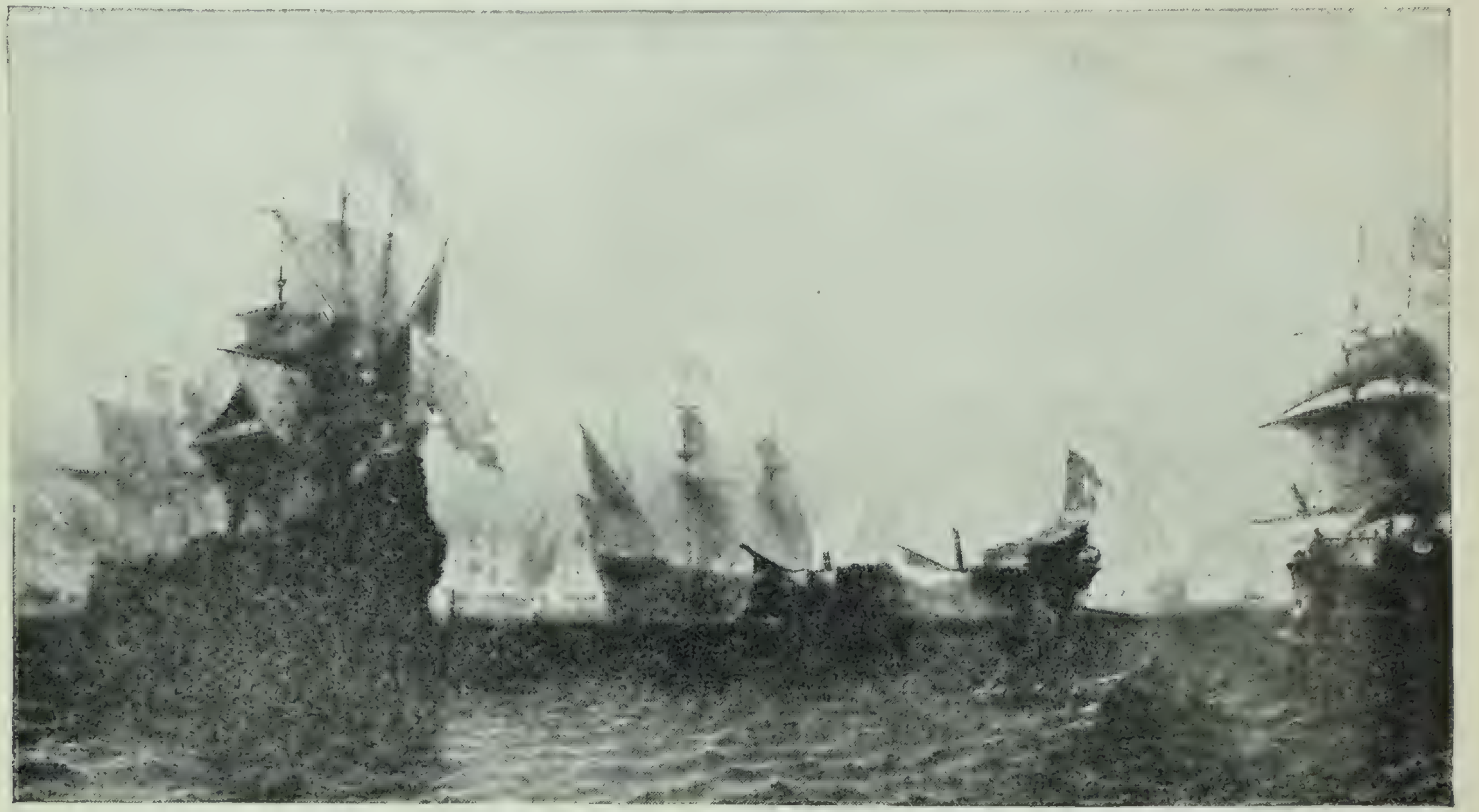
And as they hesitated the pillars of the bridge, attacked by axe and lever, began to give way, and the Romans shouted to their gallant defenders:

"Back Horatius, Lartius, Herminius—back ere the bridge falls."

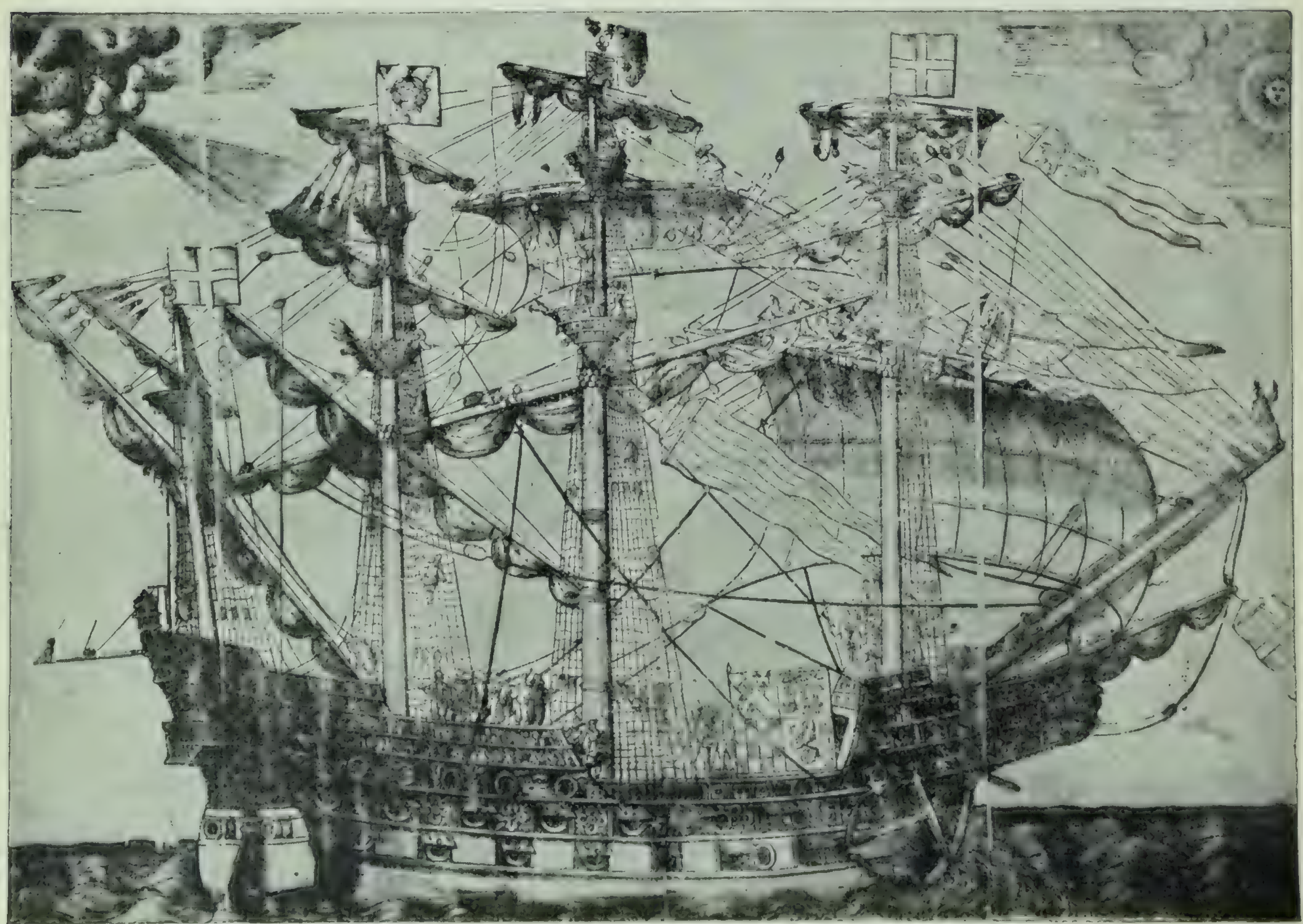
His two companions rushed back just in time, but before Horatius could gain the safety of the farther shore, half of the bridge fell, and there was he, alone, before him the

THE LAST FIGHT OF THE LITTLE "REVENGE"

And a Picture of Howard's Flagship



There is something majestic in this picture of the last moments of Sir Richard Grenville's ship, *The Revenge.* She has fought the Spanish " sea-castles " for fifteen hours, darting in and out and pouring her shot into their wooden sides. Now she lies disabled and defeated, but not dishonoured, and the Spanish fleet stands round her in respect.



Lord Howard left Sir Richard Grenville at Flores, in the Azores, just before Sir Richard met with the Spanish fleet. Howard's flagship, the *Ark Royal*, is seen above. It gives a very good idea of the elaborate decoration lavished on the warships of Elizabethan times. The *Ark Royal* led the English fleet to fight and defeat the Spanish Armada.

great host of the enemy, behind him the roaring waters of the flooded Tiber.

Lars Porsena called on him to yield.

Horatius, disdaining to reply, flung himself into the swirling waters of the river. It would have been a tremendous swim under ordinary circumstances, but, badly wounded and weighted down with his armour as he was, it seemed impossible for him to survive.

Friends and enemies alike held their breath as he put up a gallant struggle, and when at last he reached the bank a great shout rent the air; the people flocked eagerly around to do honour to the man who had so valiantly saved their beloved city, Rome.

THE "REVENGE" FIGHTS HER LAST BATTLE

IN 1591, some years after the defeat of the Armada, Sir Thomas Howard, with Sir Richard Grenville as his second in command, was cruising with a small fleet of six ships off the Islands of the Azores. Grenville was on board the *Revenge*, a gallant little vessel which had been the flag-ship of Sir Francis Drake at the time of the Armada.

One day, while the English ships were watering in Flores Bay, news was brought that the Spanish fleet of over fifty vessels was fast approaching. Howard decided it was useless to put up a fight against such odds so he gave orders to hoist sail and away.

He, with five of his vessels, got safely away, but Sir Richard Grenville, delayed perhaps by having some of his sick men on shore, did not sail with the others, and just as he was ready to weigh anchor, the great Spanish galleons hove in sight.

There was still time, however, to get away, for the little *Revenge* could sail much more quickly than the larger enemy ships, and Grenville's officers urged him to put out to the open sea. But Sir Richard indignantly refused. Let the Spaniards see him flying from them ! Never ! He would stay and fight them to the death, though the odds were one against fifty-three.

The little *Revenge* ran on towards the Spanish fleet, determined "to pass through the squadron in spite of them, and force them to give them way." But the first galleon they met, the great *San Felipe*, took the wind from their sails and they were almost becalmed.

It was about three o'clock in the afternoon when the fight began, and all through the short summer night it continued.

Only two or three of the great Spanish ships could draw near at a time, and the guns from the low-lying *Revenge* got in such well-aimed shots that each enemy ship in its turn was glad to draw away with gaping wounds in its side, while the higher placed Spanish guns injured chiefly the masts and the rigging of the little English ship.

By midnight two of the Spanish ships were so badly damaged that they could fight no more, but others quickly came up to take their place, while the little *Revenge*, frightfully battered, still put up a gallant fight. Half of her fighting men were slain, and Sir Richard himself was wounded twice, but he refused to leave the deck, where he directed the battle, and still he cried, "Fight on, Fight on."

But when the morning dawned the little *Revenge* was in a terrible plight. Her masts were gone, her upper deck was torn away and she was leaking badly. But worst of all, her powder and shot were almost done.

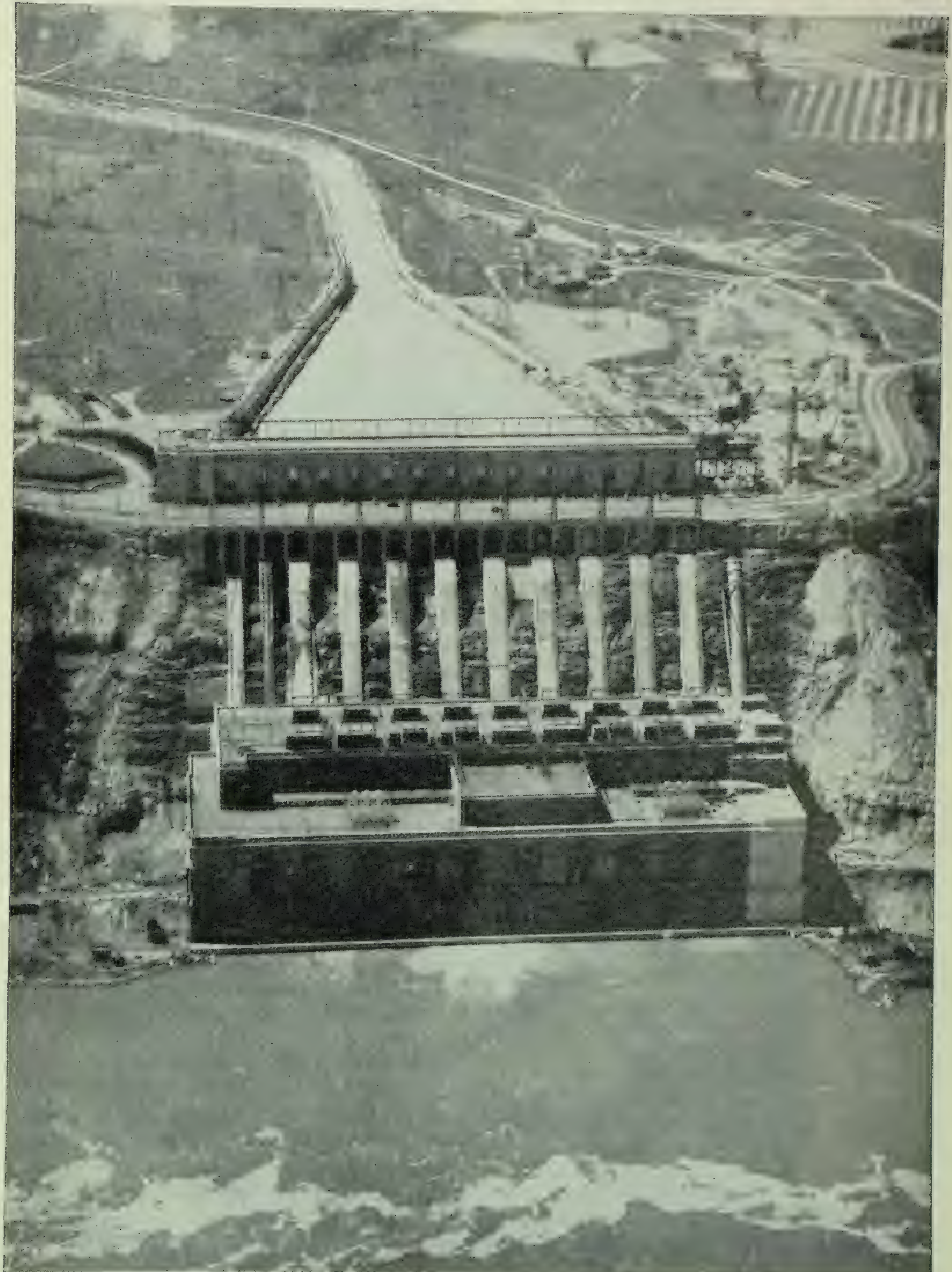
Then Sir Richard turned to his gunner and asked him to blow up the ship with what gunpowder remained. The gunner was willing, but the officers wished to live to fight again. So they offered to yield if the Spaniards would promise them their lives and hold them to ransom. Sir Richard lay dying; he could do no more, and so he was carried aboard the Spanish flag-ship. The officers of the enemy ships gathered round to do honour to such a gallant foe, but he wanted none of their praise. With his dying breath he managed to stammer out words which our poet Tennyson has put into verse :

"'I have fought for Queen and Faith
Like a valiant man and true,
I have only done my duty,
As a man is bound to do.
With a joyful spirit I,
Sir Richard Grenville, die——'
And he fell on their decks and he died."

Two Spanish ships had been sunk, a third so badly damaged that it had to be abandoned, and a fourth had run aground, before the fight finished. Then, as they sailed away, a great storm arose and several of the other damaged ships were wrecked.

The gallant little *Revenge* was in such a sorry plight that she could not weather the storm, and "she went down by the island crags to be lost ever more in the main."

NIAGARA HARNESSED TO GIVE POWER



An air view of the Chippewa hydro-electric plant at Queenstown, Ontario, Canada. The water of the river is led to pipes sloping downwards to the power house below. The water rushes down and through the turbines, making electrical power for distribution to the cities and towns round about. The immense size of the plant can be gathered if you compare it with the two motor-cars on the road above, in the centre of the picture.

A primitive method of watering the fields in hot dry lands. The water is raised from wells and poured into channels.

MAN HARNESSES NATURE

This is the story of man's harnessing of the forces of Nature to serve his need. He has conquered the air, and made the waterfalls light up his towns and drive his factory machinery. Heat has been made to perform great tasks in assisting his enterprises, and sound has been employed to warn and guide. Light has been split up into its parts, and while the visible rays guard our rocky coasts and give us illumination at night, the invisible rays have been made to perform miracles unknown years ago. Electricity, the world's life-force, has become man's daily friend. Some of these wonderful inventions, discoveries and adaptations are described in word and picture in this section.

MAN is a child of Nature, and is dependent upon Nature for his very existence. To-day we need air, water, heat and food, if we are to continue to live, just as much as the earliest forms of life on earth were dependent upon these things, and in these respects the only difference between ourselves and the creatures which first peopled the seas is that we have to a certain extent learnt how to master and control the great forces of Nature, and to turn them to the service of mankind.

Life cannot exist without water. In places where there is no water, or where the rainfall is very small, the earth becomes a desert incapable of supporting life, whilst in other places the rainfall is so great that there is more water than is needed. This unequal distribution of water has occupied man's attention for thousands of years, and, ever since he began to be anything like a civilised human being, he has been thinking out ways of storing the precious fluid against times of drought, or of transporting it from places where there is water in plenty to places where there is none.

This control which man has gradually been establishing over water has made habitable many desert places of the earth. Egypt was a desert until the ancient Egyptians discovered how to use the annual flooding of the Nile to water their fields, and still to-day the natives in many parts use the primitive water-wheels, composed of earthen pots fixed to an endless chain, to irrigate their land, exactly as their ancestors used them thousands of years ago in the times of the Pharaohs. Nowadays, however, side by side with these primitive methods of irrigation, there exist in Egypt great dams and irrigation canals by which the water of the Nile is stored up and distributed over the thirsty land, with the result that Egypt, which is practically a rainless country, is assured of a plentiful water supply, and no longer lives in fear of drought and famine. These are described elsewhere in this volume.

What has been done in Egypt has been done in other countries. In India and Australia thousands of miles of desert country have been made to blossom and support life by means of dams and canals which store up and distribute the water, which in the past ran away into the sea and was wasted. Australia, in this respect, is worse off than most countries, for in some parts there is no surface water at all to be had, not even by damming rivers and cutting canals. In these areas deep borings have been made, and iron pipes sunk into the earth until the hidden reservoirs of water beneath the earth's surface have been reached. These wells are called artesian wells. Some of them are thousands of feet deep, and up them the water gushes from the springs and reservoirs below, watering the thirsty earth, and making it habitable for man. You may make a model Artesian well if you follow the instructions given on page 274.

Switzerland, with its glaciers and mountain torrents, is the last country in which we should look for desert areas. Yet, in the Canton of Valais, there are plateaux and mountain slopes where there is very little rainfall. They are so high above the mountain torrents raging through their gorges far below, that, though there is water in plenty close at hand, the plateaux and mountain slopes would be desert and barren if left to themselves. The hardy Swiss mountaineers, however, have no intention of letting all this fertile land be wasted. So for hundreds of years they have been practising a system of irrigation which is in some ways the most wonderful in the world.

HOW THE SWISS PEASANTS MAKE USE OF THE SNOW.

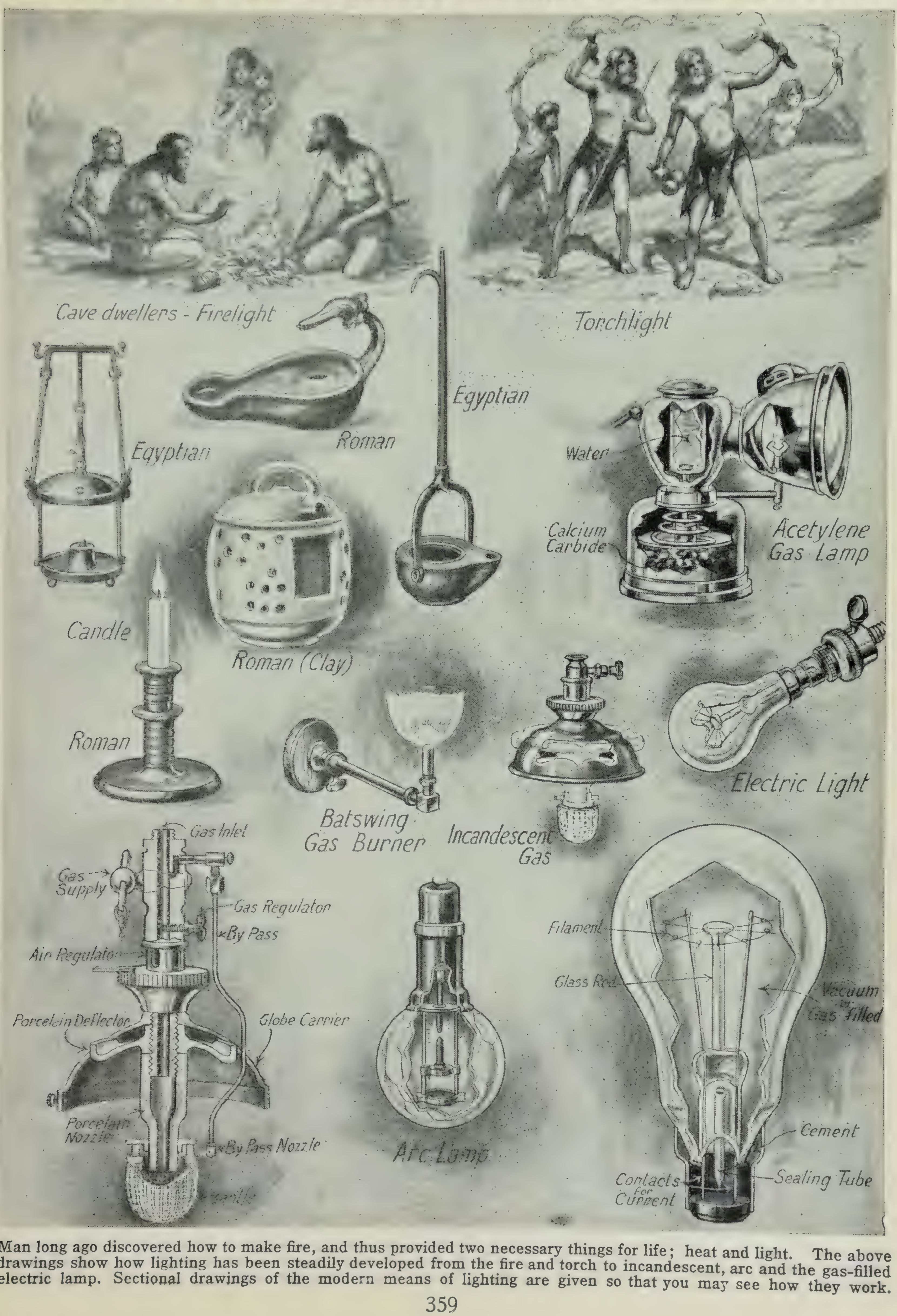
The system consists of tiny canals and aqueducts, called *bisses*, which carry the water from the melting snows and glaciers high up in the mountains to the thirsty acres beneath. These *bisses* are often no more than eighteen inches wide and a foot or so in depth. They start as tiny channels cut into the solid rock, and wind their way down the mountain sides, over deep chasms, and along the sides of dizzy precipices, where the water runs along hollowed tree trunks or wooden troughs which are fixed to the face of the precipice by strong iron clamps. Water is very precious in this part of Switzerland. Each land-holder is allowed so much water and no more, and if he is found opening the sluice which allows the water to flow over his land when it ought not to be open, or keeping it open longer than he is allowed, he is summoned before the authorities and punished with a fine.

To water and make fruitful the barren places of the earth is only one of the ways in which man has forced water into his service. The seas of the earth are the highroads between the different nations, and man has extended these watery ways by cutting great canals, such as the Panama Canal and the Suez Canal, by which water is forced to bear his ships from one sea to another, across places where before there had been dry land. Water under pressure will raise lifts, and work presses and other machinery. This is called hydraulic power. Again, running water contains immense reserves of energy, and this energy is used to work great dynamos by which electricity is generated, so that in many instances our homes are lighted and heated, trams and railways are run, and the machinery in great factories made to work by the power obtained from water. So far only running streams and waterfalls have been used to generate electricity, but one day, no doubt, man will learn how to harness the immense reserve of power contained in the tides of the sea, and to turn it to his use.

WHAT WAS THE EARLIEST FORM OF ARTIFICIAL LIGHT?

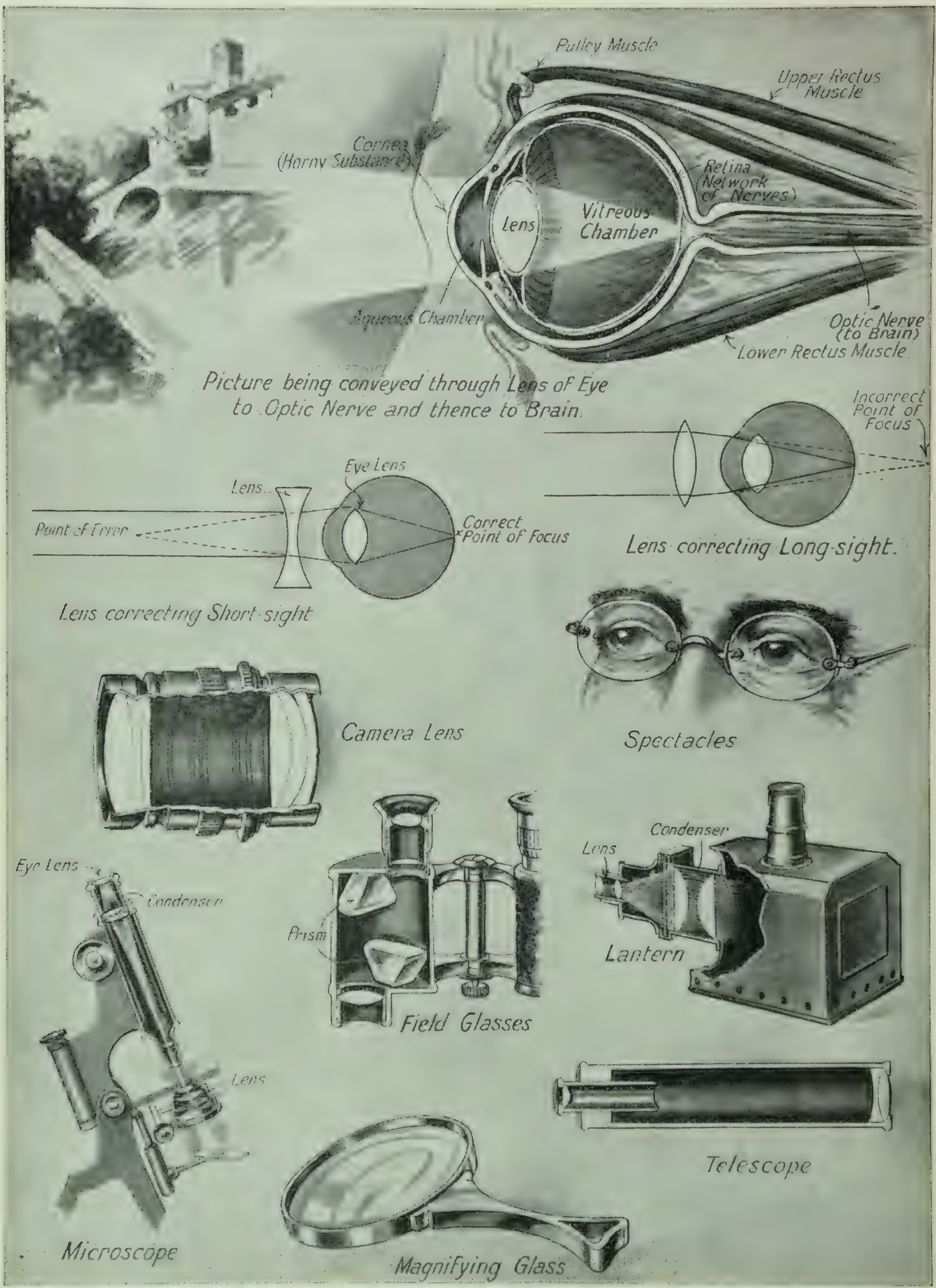
Light is another force of Nature upon which human beings are more or less dependent, and ever since the first savage lighted a dry stick at his fire, and with its flare illuminated the dark recesses of his cave, mankind has been striving to bring light under his control, and to create artificial light to make bright the hours of darkness when the sun has sunk below the horizon. Torches were the earliest form of artificial light used in olden days. Then came primitive lamps, burning fluid bitumen, or fats and oils such as the Eskimos use to-day. Primitive candles were manufactured by the ancient Romans, and for many centuries candles and lamps were the only sources of artificial light known to man. New experiments showed that coal gas could give brilliant light. At the beginning of the nineteenth century it was discovered that coal gas could be used to give a light several times more brilliant than the brightest candle, and gradually gas took the place of lamps and candles. For a long time gas was the chief artificial illuminant; then electricity began to dispute its supremacy, until nowadays we have the delicate gas mantle, made of rare unburnable substances and giving off a very brilliant light, competing with the delicate metal filaments of the electric lamp, which are so tough that the resistance they offer to the passage of electricity through them causes them to glow and give off a dazzling illumination.

ROMANCE OF LIGHTING THROUGH THE AGES


Cave dwellers - Firelight
Torchlight
Roman
Egyptian
Egyptian
Water
Calcium Carbide
Acetylene Gas Lamp
Candle
Roman (Clay)
Roman
Electric Light
Batswing Gas Burner
Incandescent Gas
Gas Inlet
Gas Supply
Gas Regulator
By Pass
Air Regulator
Porcelain Deflector
Globe Carrier
Porcelain Nozzle
By Pass Nozzle
Arc Lamp
Filament
Glass Rod
Vacuum or Gas filled
Cement
Contacts for Current
Sealing Tube

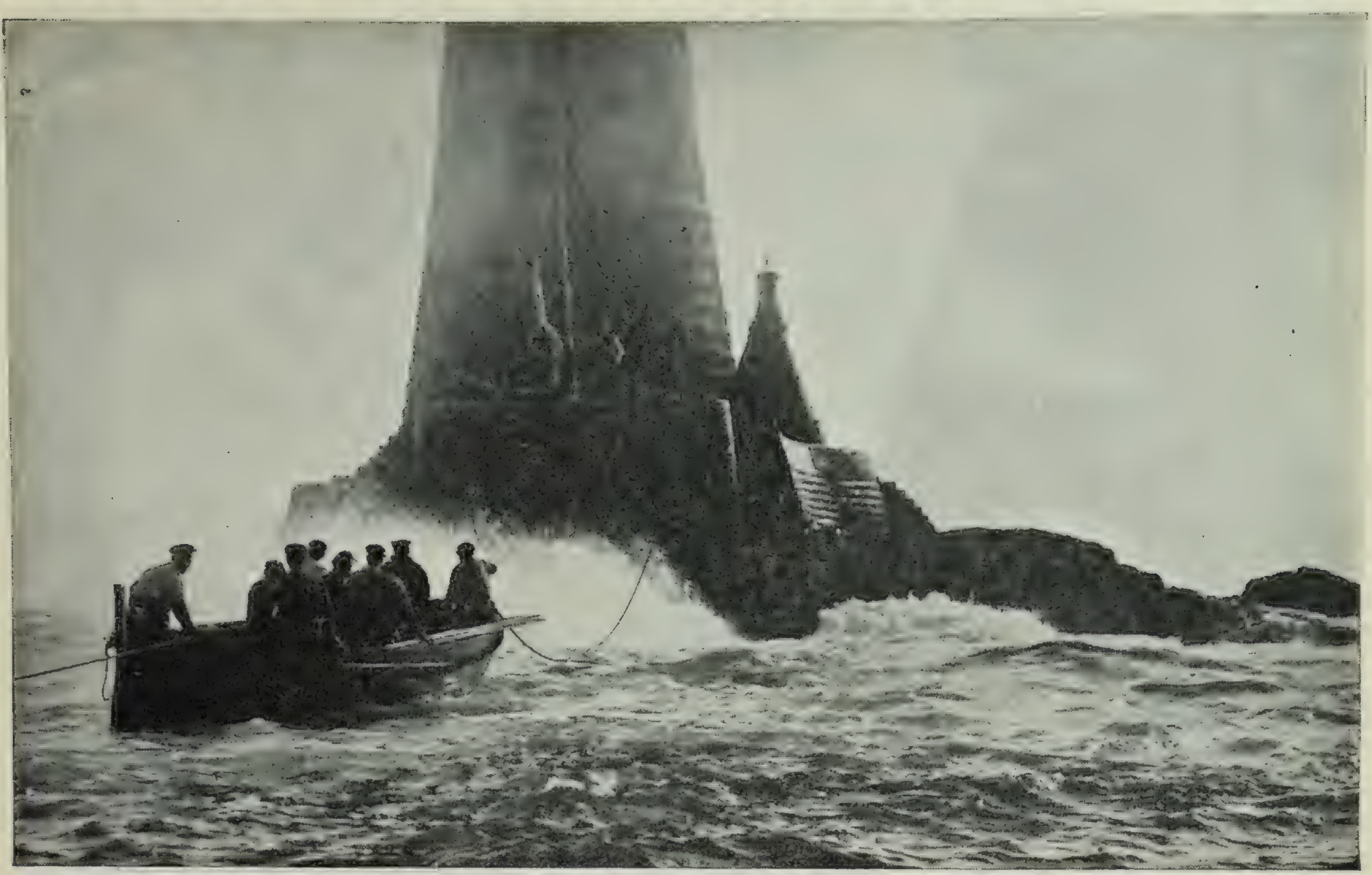
Man long ago discovered how to make fire, and thus provided two necessary things for life; heat and light. The above drawings show how lighting has been steadily developed from the fire and torch to incandescent, arc and the gas-filled electric lamp. Sectional drawings of the modern means of lighting are given so that you may see how they work.

HOW MAN LEARNS FROM THE HUMAN EYE

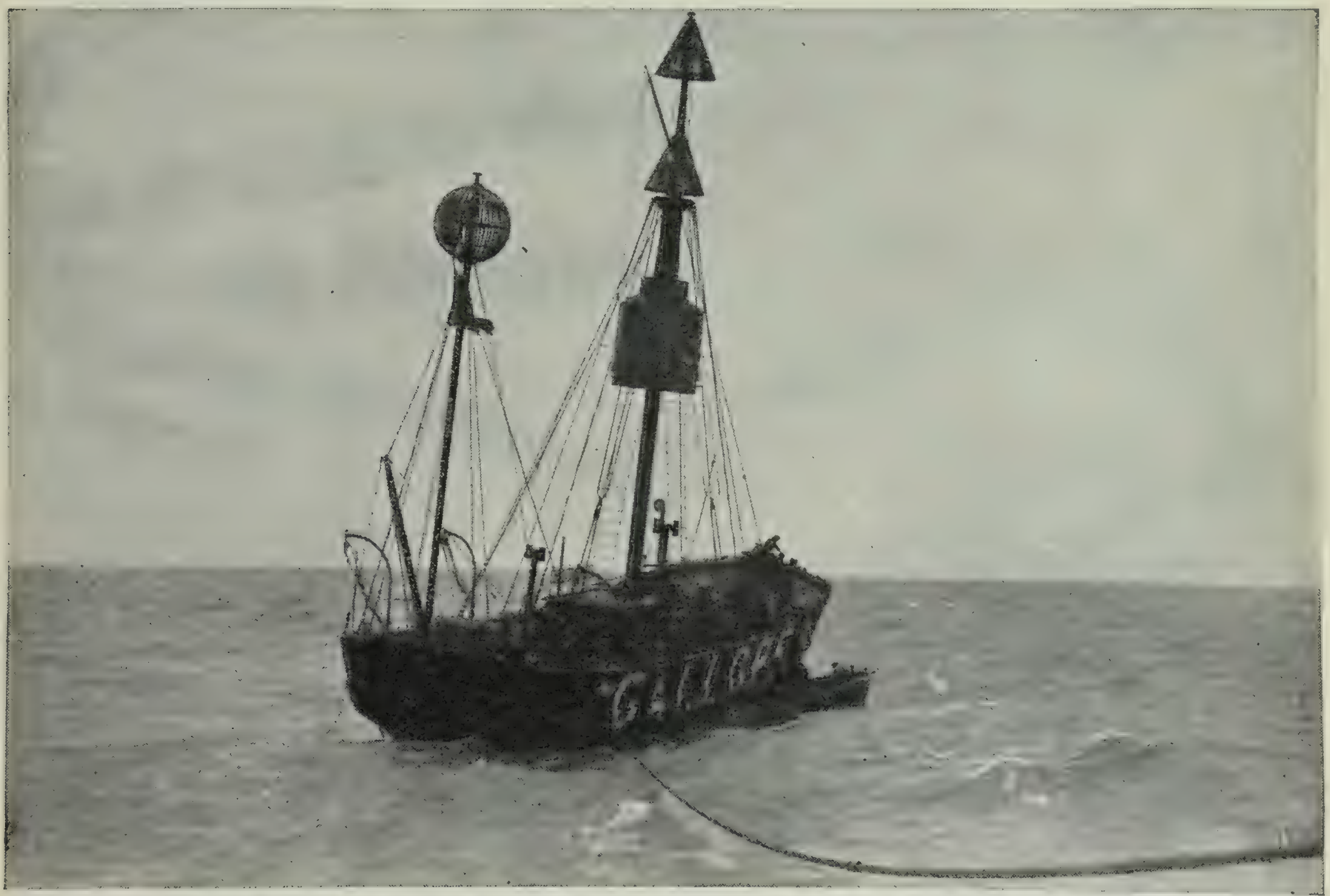

Pulley Muscle
Upper Rectus Muscle
Cornea (Horny Substance)
Retina (Network of Nerves)
Lens
Vitreous Chamber
Aqueous Chamber
Optic Nerve (to Brain)
Lower Rectus Muscle
Picture being conveyed through Lens of Eye to Optic Nerve and thence to Brain
Incorrect Point of Focus
Eye Lens
Lens
Point of Error
Correct Point of Focus
Lens correcting Long-sight.
Lens correcting Short-sight
Camera Lens
Spectacles
Condenser
Lens
Eye Lens
Condenser
Prism
Lantern
Field Glasses
Lens
Telescope
Microscope
Magnifying Glass

The uses of lenses are shown above, and the drawings explain themselves. Note that short-sighted people need concave glasses (thicker at the edges than in the middle), while long-sighted people need convex lenses in their spectacles (thinner at the edges). The arrangement of lenses in various optical instruments is demonstrated by diagram.

DARING THE DANGERS OF THE DEEP

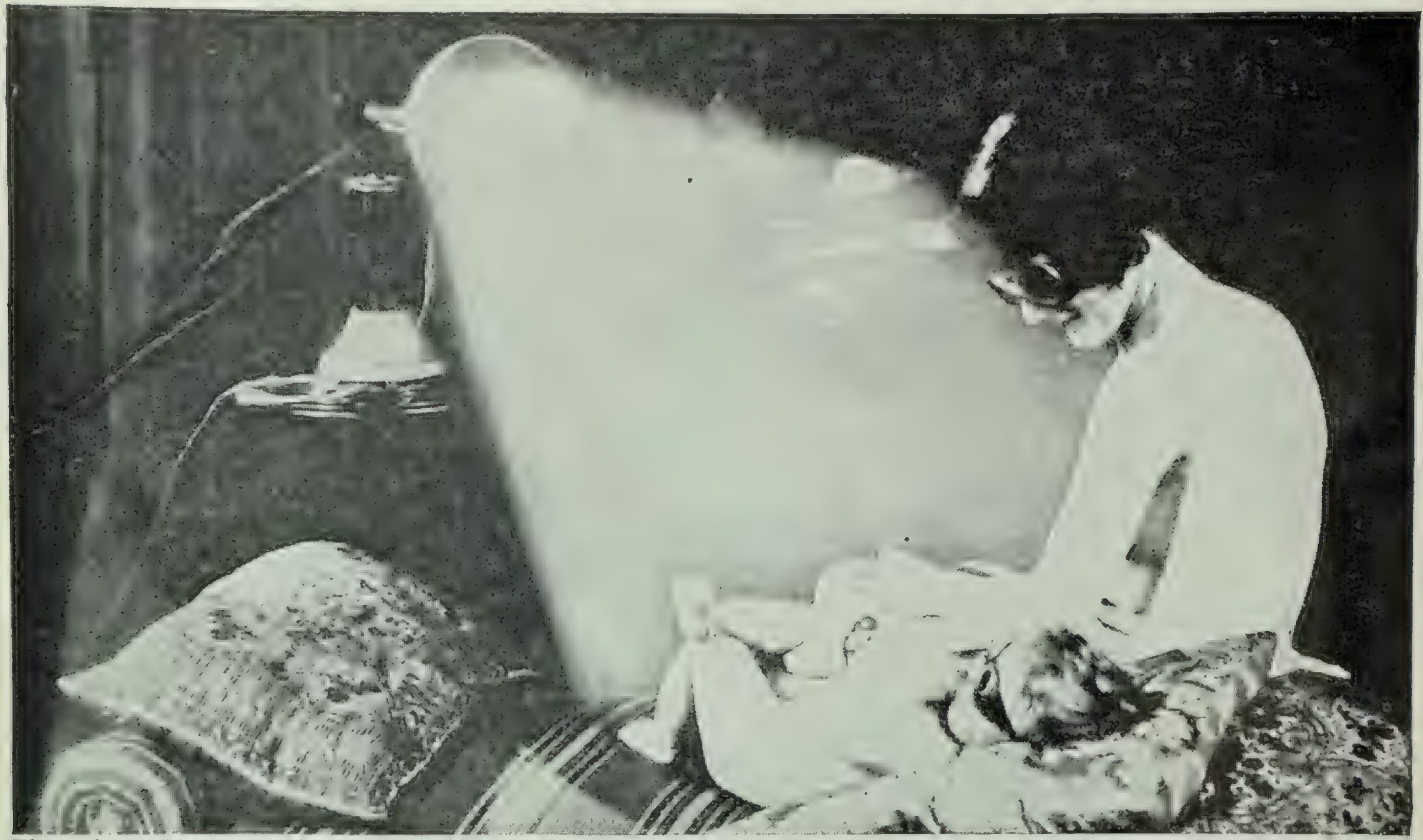


Lighthouse-keepers lead a lonely life, isolated in their ocean watch-towers cut off from the companionship of their friends on the mainland. Their task of keeping the beacon alight warns sailors that there is danger ahead on the rocks. The picture shows relief keepers arriving at Wolf Rock Lighthouse in heavy seas. [*W. F. Taylor*

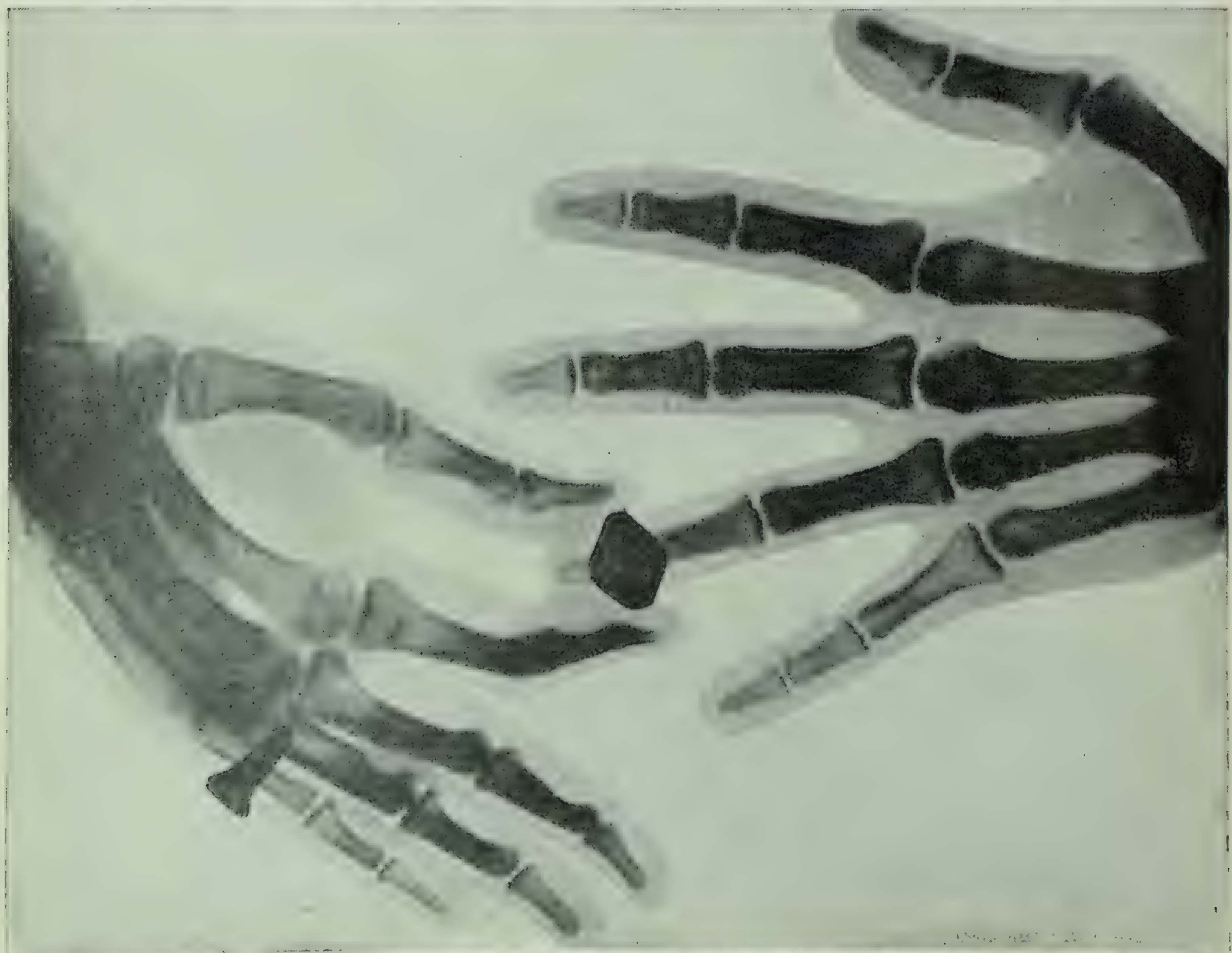


Lightships are moored upon a shoal or at some other dangerous point near a coast to give warning to shipping by showing a light at their mast-heads. The men in charge are relieved at intervals from their task of guarding the lives of the sailors, but some lightships are unattended and work automatically. [*W. F. Taylor*

THE ROAD TO HEALTH—BY MODERN METHODS

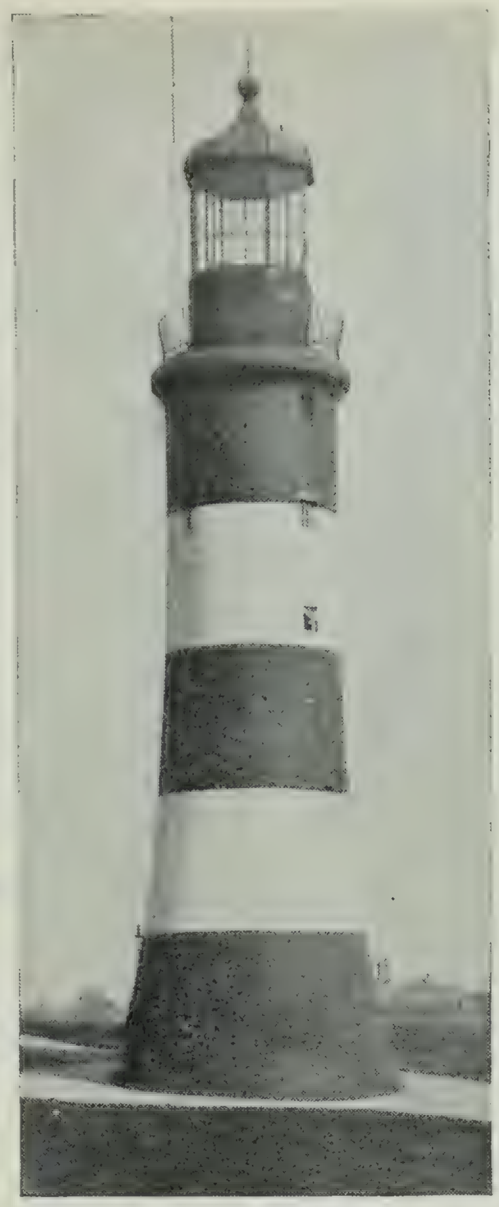


There is nothing more beneficial to the health than sunlight. Nature, however, is not very lavish with it at times, but doctors have discovered how to produce artificial sunlight, and use it as a modern method of toning up the system.



One of the cleverest aids to modern surgery is the new invention whereby doctors are able to see to the root of a patient's disease. This X-ray picture of a ring being placed on a finger shows clearly the skeleton of the hand.

Light serves man in many capacities, and the more he extends his mastery over it the more does he bring it into his service. The primitive beacons, which were once the only form of coast light known, have long given place to great lighthouses, the beams of light from which shine out for mile after mile across the sea, guiding seafarers on their way and warning them of danger. Every year, scores of ships are saved from wreck, and thousands of sailors owe their lives to the great beacons which man's ingenuity has reared around the coasts of the earth, or upon isolated, wave-swept rocks far out at sea.


Smeaton's old Eddystone Lighthouse re-erected on Plymouth Hoe.

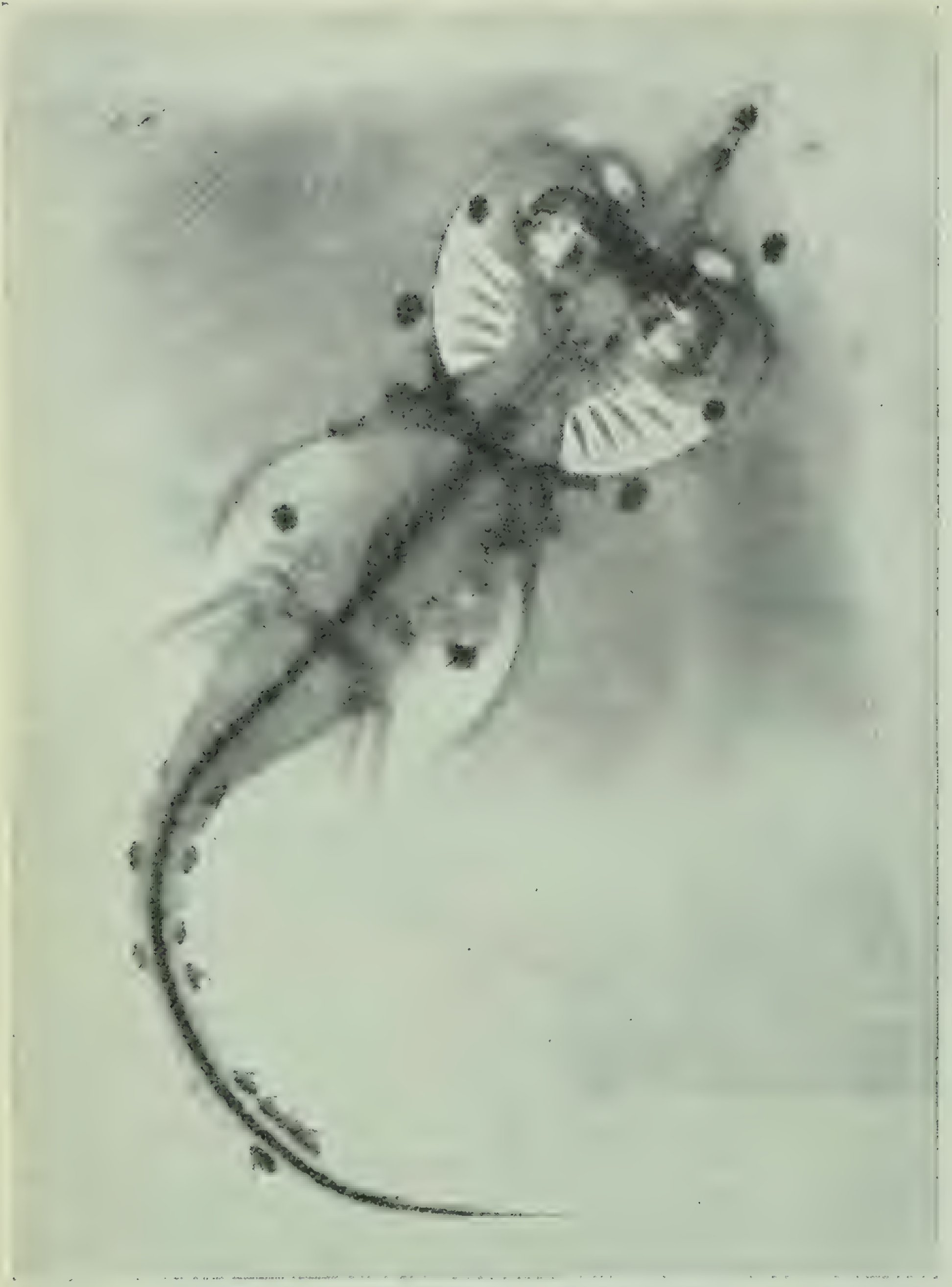
HOW LIGHT HAS REVEALED THE SECRETS OF THE STARS.

Astronomers use light to tell them the secrets of stars far away in the depths of space. Light is composed of different coloured rays, and, as different substances give off different kinds of light, so it is possible to tell, by examining the colours and groupings of colours in the light of any given star, just what metals and gases are present in that distant sun billions of miles away from the earth. The wonderful instrument which tells us so much about the distant suns of space is called a spectroscope, and you will find it more fully described in another part of this book.

The light of the sun is composed of different coloured rays just as is the light of other stars. These rays have different properties, and man has discovered many of these properties and turned them to his use. When people lie out in the sunshine and get brown and healthy they are absorbing the ultra-violet rays in the sunlight into their bodies. These rays contain great health-giving properties, and, because it is not always possible to lie out in the sunshine and absorb these rays into our naked bodies, man's ingenuity has turned to the invention of lamps which give off the same life-giving rays which are found in sunlight, so that it is now possible to sit indoors on a cold, gloomy winter's day, and become brown and healthy by basking in artificial sunshine.

In photography it is these same ultra-violet rays which give us pictures and snapshots of our holidays. The different coloured rays in light affect to a greater or lesser degree the sensitive silver emulsion upon the photographic film, so that when the exposed film is placed in certain chemicals it darkens to different intensities, and a negative is produced from which the final picture is printed. When the printing frame is put out in the sunlight, and the paper under the negative darkens, the same thing is happening as when you lie out in the sunshine and get sun-browned. But, whilst most rays of light affect the ordinary photographic plate to some extent, there are some which have no effect upon it at all.

A silent watch-tower, Trevore Head Lighthouse, in Cornwall, keeps guard over the coast, always ready to give the danger-signal to ships in distress. Its light shines untiringly over the waters every night. [*W. F. Taylor*



Here is a glimpse of a Skate Fish as the X-rays reveal it, showing the creature's bony structure in wonderful detail. [*Kodak, Ltd.*

These are the red rays in light, and that is why a piece of red glass is placed in front of the light in the room where the sensitive film is developed. This red glass has the effect of cutting off all the rays of light which would fog the sensitive film, and of allowing only the red and harmless rays to pass through, with the result that the film can be developed without risk of its being spoilt, as would surely happen were it developed in ordinary light.

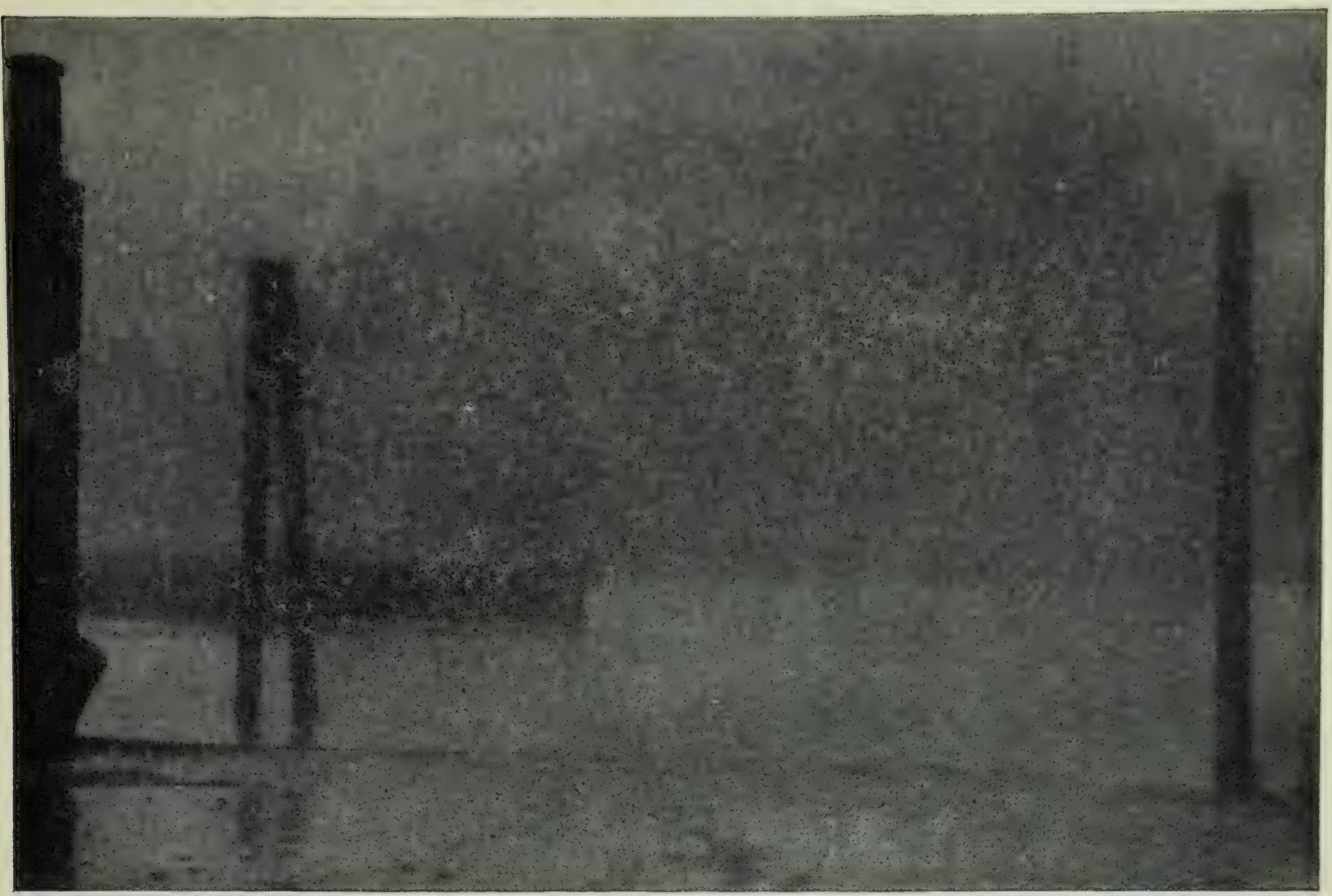
THE MYSTERIOUS RAYS THAT PHOTOGRAPH THE HUMAN SKELETON.

You have already read how artificial sunlight is produced by lamps and used for health purposes. Another discovery of modern times, and one of far greater benefit to the human race, had been the discovery of the X-rays by a scientist named Röntgen in 1895. These rays are given off through a little aluminium plate which is fixed into a glass tube from which all air has been excluded. One day Röntgen was experimenting with such a tube, and having covered the tube with a black cloth, he passed an electric current through it. To his amazement, he saw that a chemical screen near the tube was beginning to shine, and realised that the mysterious rays, produced by the passage of the electrical current through the tube, had passed right through the black cloth on to the screen.

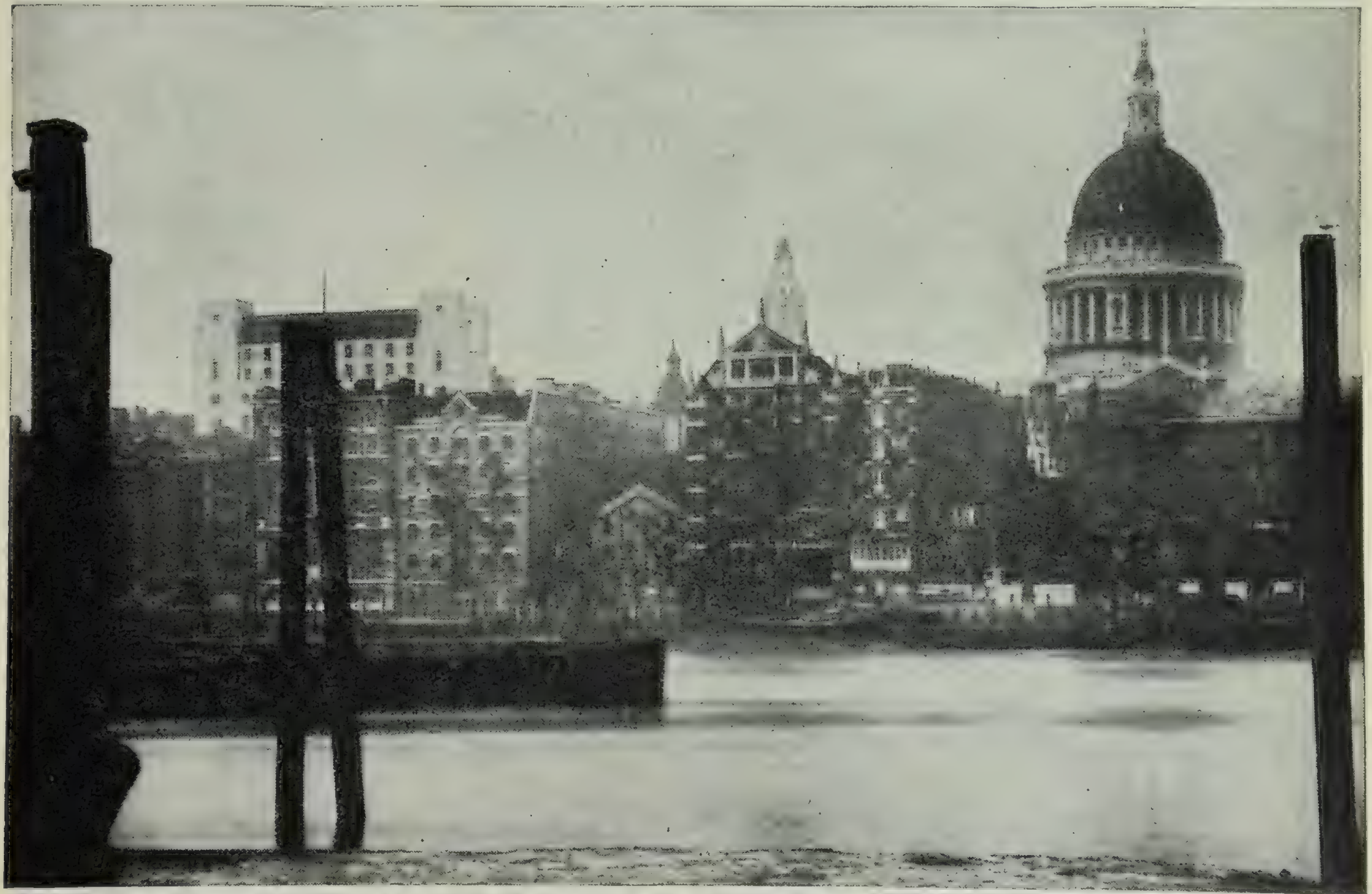
In such a manner were the mysterious X-rays discovered. Once their extraordinary properties of penetration had been experienced, it was soon discovered that they would also pass through human flesh, stone and many other solid substances, whilst other things, especially metals, stopped or partially stopped the rays. It is this power of penetration which makes the X-rays so valuable. Dentists use them to examine their patients' teeth. With their aid it is possible to photograph the human skeleton, and the inside of the human body, to tell if bones are broken or have set properly, to locate in the body foreign substances, and to tell when the body is healthy or diseased.

What are these marvellous X-rays, and to what do they owe their power of penetration? To begin with they are *light*. Now there are waves of light just as there are waves of sound, and the difference between the various kinds of light is accounted for by the length of their corresponding waves. When you see different colours your eyes are simply receiving light waves of different lengths, and it is this difference in length which accounts for the varying colours of light, and for the powers of penetration different lights possess. For instance, the health-giving ultra-violet rays in sunlight will not pass through fog, but the red rays will, and that is why the sun appears as a dull crimson ball when seen through a fog. The same thing happens when we get a crimson sunset. The earth's atmosphere has cut off the violet rays, but it is penetrated by the red rays, and so the sun sinks in a bed of crimson glory. Now the length of an X-ray

A MIRACULOUS PHOTOGRAPHIC FEAT

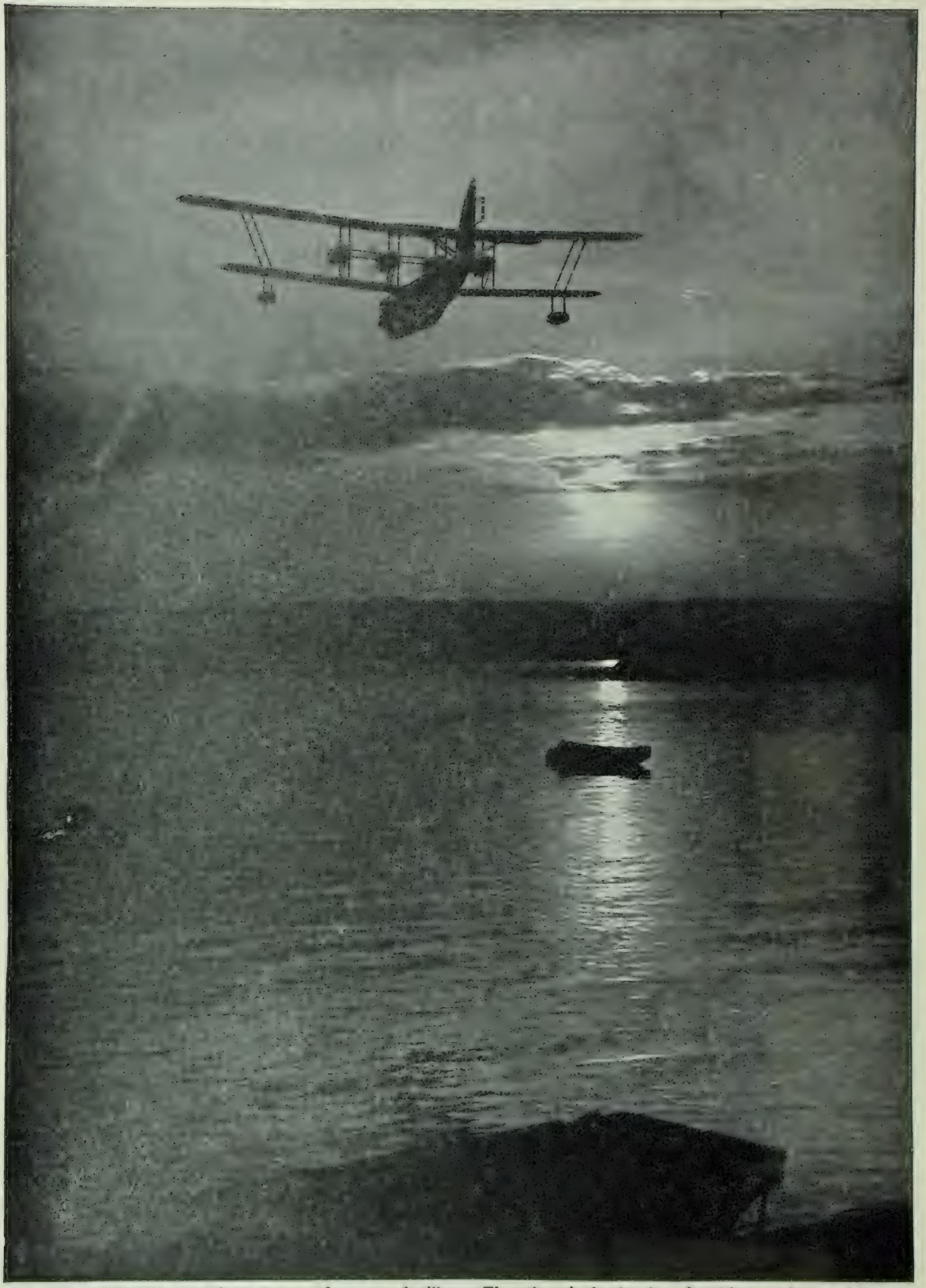


Can you believe that this photograph and the one below were taken at the same time, during one of London's dense fogs? This photograph was taken with an ordinary camera and plate, and shows little else besides the thick fog. [*J. Dixon-Scott*



This beautiful view of the Thames, with St. Paul's in the background, taken during a fog, owes its clearness to the new infra-red method. Even the tiny bird that you see perched on the pole in the foreground is shown in perfect detail. This method of photography makes it possible for us to take some marvellous pictures. [*J. Dixon-Scott*

A GEM OF THE ARTIST-PHOTOGRAPHER'S ART



Late sunset over the water gives a scene of peace and stillness. Then there is the droning of multiple engines and the seaplane swings into the picture. Sunset photographs need skill and perfect timing of the exposure—which should be brief.

wave is somewhere about the ten-millionth part of one twenty-fifth of an inch, and it is to this extreme shortness that the X-rays owe their powers of penetrating solid, opaque substances which are impervious to other forms of light.

Another way in which man is bringing light under his control is in television, which is fully described elsewhere in this book.

THE INFRA-RED RAYS THAT ARE INVISIBLE TO THE HUMAN EYE.

You will have grasped by this time that all light is not visible, and just as there are sounds too high or too low for the human ear to hear, so there are waves of light invisible to the human eye, and one of the very latest ways in which light is being pressed into the service of mankind is in the use of invisible rays to work burglar alarms, and to mount guard over jewels and other objects of great value. The secret of this marvellous invention is a chemical called selenium which is very sensitive to light. Now selenium possesses the extraordinary quality of being a non-conductor to electricity in darkness and a conductor in light, and it is this quality which has been used in this wonderful invention. In the case of the burglar alarm a piece of apparatus called a selenium bridge is placed on one side of a room, whilst on the other side, its light shining on the selenium, is a lamp emitting infra-red rays. These rays are invisible to the human eye, but so sensitive is the selenium to light that, once the lamp is switched on, and the rays directed upon the selenium, the selenium becomes a conductor to electricity, and a complete electrical circuit is made. Now see how this invisible burglar alarm works. The housebreaker, entering the room, unwittingly passes through the invisible ray of light, and at once the selenium, cut off from the light, becomes a non-conductor, the electrical circuit is broken, and the alarm bells begin to ring.

HOW WE MAY HARNESS THE INVISIBLE RAYS TO DO OUR WORK.

The infra-red rays have now been harnessed to photography, and it has been found that a photograph taken by the infra-red process shows more detail than an ordinary photograph. By this means a clear photograph may be taken through thick fog. The two pictures on page 365 show how the infra-red rays can penetrate the thickest atmosphere.

This is one of the simplest ways in which light acting upon selenium can be made to switch on and off an electrical current, and to perform various operations without the help of human agency. Street lamps can be lighted and put out; doors opened and shut. The device could be used to stop trains and to start them again, and might be made a great factor for safety upon our railways. At a recent great exhibition in London some very valuable jewels were guarded by the invisible ray, and any one trying to approach too near them would have found himself shut in the room, and the guardians of the exhibition warned by the burglar alarms of his actions.

Light, as you will have realised by this time, is a very wonderful thing, and the more scientists probe into its secrets the more wonderful will it become.

Heat is another great natural force which has been pressed into the service of mankind. What is heat? Heat is *molecular motion.* This is rather a teaser, is it not, but it is easily explained.

HOW DOES A POKER PLACED IN THE FIRE BECOME HOT?

The earth itself and everything on or in the earth, such as coal, iron, air, water, our own bodies, are made up of millions of tiny particles of matter called molecules, and these molecules are in turn made up of still tinier atoms, all of which are in a state of perpetual motion. Now when a piece of coal is burnt the molecules of which the coal is made up are violently agitated, and this agitation is the cause of the heat given out by the burning coal. If an iron poker is now put into the fire, the heat from the burning coal sets up agitation in the molecules forming the poker, with the result that the temperature of the iron is raised until in time the poker becomes red-hot. Suppose the poker is now taken out of the fire. Immediately the agitation amongst its molecules will start to abate, and the poker will begin to cool, but if, on the other hand, it is allowed to remain in the fire the molecular motion will go on increasing until from being red-hot the poker becomes white-hot. From this you will gather that the more violently the molecules of a substance are agitated the hotter it becomes, and this is what is meant when we say that heat is molecular motion.

One of the curious things about heat is that it can be made *from* work, as well as be made *to do* work. The savage who rubs two sticks together, and so produces fire, makes heat *from* work; if he were now to put an ordinary kettle full of water on to his fire, and let the water boil until the steam lifts the lid, then heat *is doing* work, the work in this case being the simple task of raising the lid of the kettle by means of the steam given off by the boiling water.

HOW WE FIND HEAT USEFUL IN MANY DIFFERENT WAYS.

Now all the ways in which mankind uses heat come under one of these two classes ; he either makes heat do work, or he makes work produce heat. The mighty express engines on our railways, the great turbines which drive the mammoth liners across the ocean, are driven by the same power which raises the lid of the kettle, and they are examples of the way in which heat is made to do work.

Another way in which heat does work is in the use of explosives. An explosion is a fire just as coal burning in a grate is a fire, the only difference between the two being that, in an explosion, the act of burning, or *combustion*, is almost instantaneous, whilst the coal fire burns comparatively slowly. What happens is this. When a substance burns, the different molecules forming that substance are broken up and their atoms released. These atoms at once combine in different ways to form gases. In the case of a coal fire the process is comparatively slow, but when the heat from a fuse sets fire to an explosive the whole process is so very rapid that the new substances formed by the released atoms cannot escape gently, and an explosion occurs. Every time a gun is fired, or a blasting cartridge exploded in a mine, every time the pistons of a motor car go round, heat is doing work, for it is heat which in the first place breaks up the molecules, and so sets free the different atoms to form the gases upon which the force of the explosion depends.

HOW HEAT CAN BE USED AS A KNIFE FOR CUTTING STEEL.

Great heat can do marvellous things. The oxy-acetylene torch and the electric furnace produce the greatest heat of anything on earth, the temperature of the flame of the torch being about 6000 degrees Fahr., and that of the furnace 7000 degrees Fahr., which is only 4000 degrees less than the estimated temperature of the surface of the sun. The oxy-acetylene torch is chiefly used to cut or weld steel. When used for cutting, the intense heat of the slender flame cuts through great bars and plates of steel and iron as easily and cleanly as a knife cuts through a bar of soap. The torch is also used for welding two pieces of metal together. When this is done, the intense heat melts the surfaces of the two pieces of metal to be joined, with the result that they combine together, and on cooling form one solid piece of metal.

The electric furnace is used for smelting ores and melting metal, and since its invention many new metals have been discovered, metals which before the intense heat of the electric furnace was available could not be separated from their ores, and were accordingly unknown.

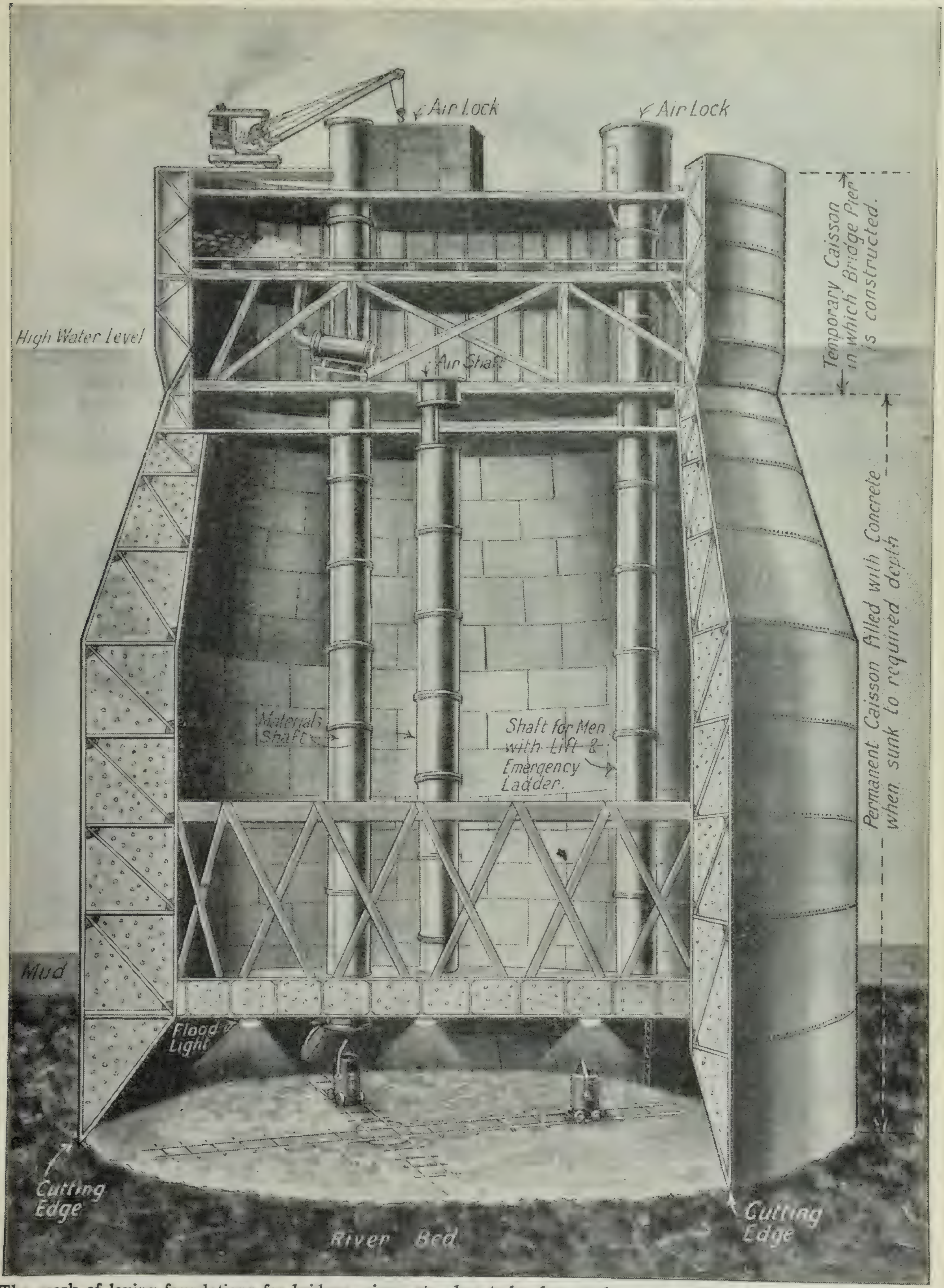
The ordinary safety match is a good example of heat made from work. The friction of the match upon the side of the box produces heat, which in turn sets alight the sulphur on the match. When you chafe the hands of a person who is very cold, you are producing heat by work.

IF WE WASTE HEAT, IT MEANS THAT WE ARE LOSING ENERGY AND POWER.

But though man has found so many ways of using heat, the amount of heat he uses is only a very small fraction of what he might use did he know how to turn it into work. Every machine that runs produces heat, and this heat is not only usually wasted, but would be actually harmful to the machine, and would stop it running, if the wheels and bearings were not kept well oiled. Our present civilisation is founded largely upon the use of coal. We require coal to drive the great dynamos which make electricity, to work our factories, our ships, our steam engines, but with all our science nine-tenths of the heat and energy in coal is wasted and allowed to escape into the air, and only one-tenth is put to any useful purpose. Heat is energy, and energy is power, and when heat is wasted power is wasted which might have done work. One day, no doubt, science will find some way of utilising some of this vast store of wasted heat, and man's control over the forces of Nature will be more firmly established than ever.

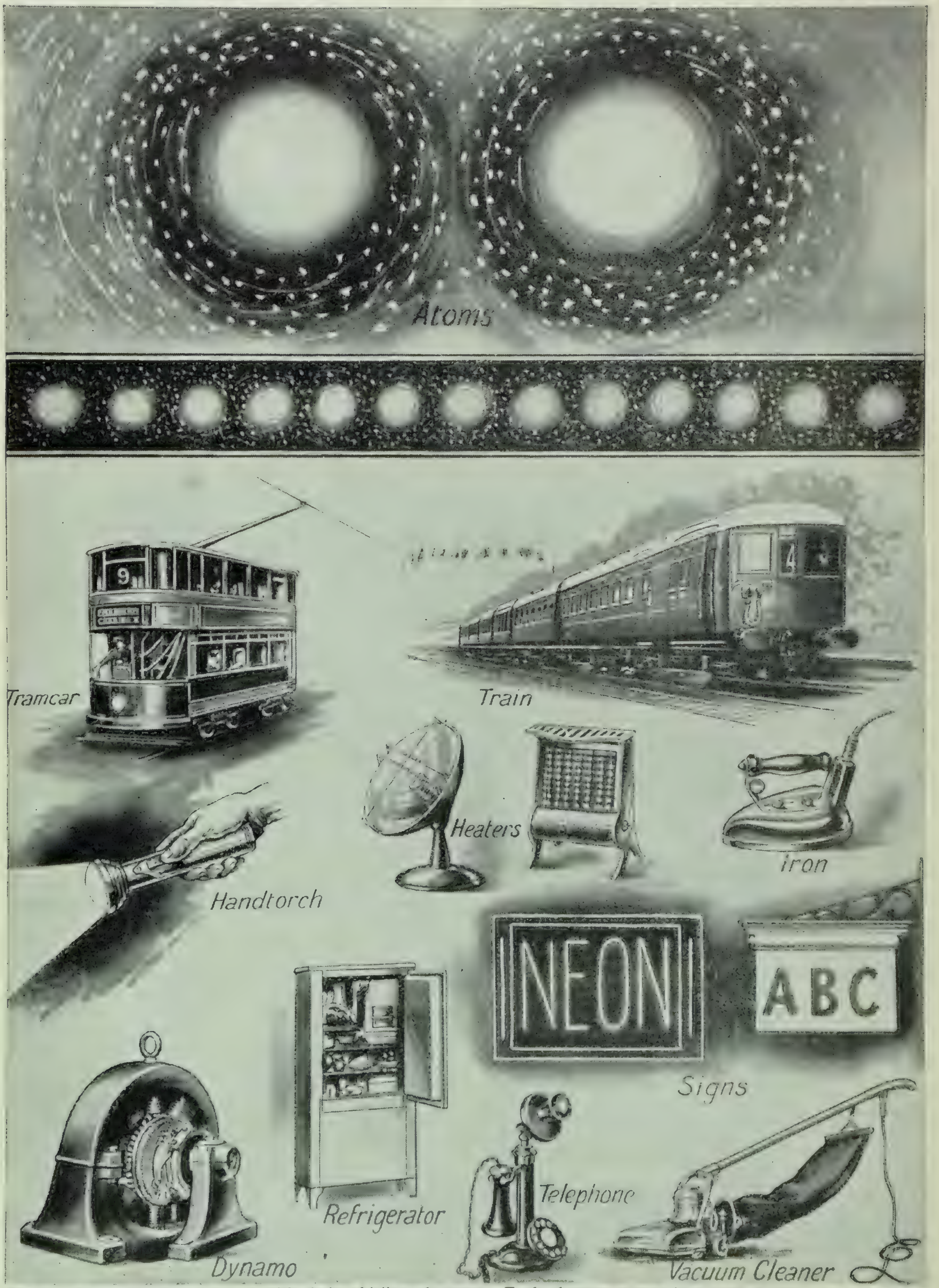
Air is the thinnest and the most intangible of the elements ; yet even this has not escaped man's domination. He has learned to support himself in the air like a bird above the earth. Air pressure is also used in many ways. It is the pressure of the surrounding atmosphere which raises the water in the common garden pump. The power behind the bullet of an air gun is compressed air, and the same force is used in many kinds of machines, and even in such undertakings as building a great bridge over water. When this is done a large iron

HOW MEN CAN WORK SAFELY UNDER WATER


Air Lock
Air Lock
Temporary Caisson in which Bridge Pier is constructed.
High Water level
Air Shaft
Materials Shaft
Shaft for Men with Lift & Emergency Ladder.
Permanent Caisson filled with Concrete when sunk to required depth
Mud
Flood Light
Cutting Edge
River Bed
Cutting Edge

The work of laying foundations for bridges, piers, etc., has to be done under water. The above picture shows the section of a caisson or under-water working chamber. The caisson is let down into the water and its sharp edges cut into the bottom, making it watertight. The shell is filled with concrete to weight it down, and the workmen descend a lift to their work. Materials come down another shaft, and air through yet another.

THE WONDER THAT IS ELECTRICITY


Atoms
Tramcar
Train
Heaters
Iron
Handtorch
NEON
ABC
Signs
Refrigerator
Telephone
Dynamo
Vacuum Cleaner

The top figure illustrates atoms with their whirling electrons. Each electron moves in a settled orbit round its atom, as the earth moves round the sun. The next drawing shows electrons running from atom to atom in an electric wire. The other pictures illustrate some of the uses of electricity, for transport, heating, lighting, communication, etc.

cylinder is sunk into the river's bed, and the water driven out by compressed air, so that the workmen are able to work on the bed of the river, and lay the foundations of the bridge far below the level of the water. When we drive in a motor car we ride on air, for it is compressed air which fills the tyres, and more likely than not it is the same thin, invisible element which fills the cushions upon which we sit.

One has only to compare a chimpanzee or a gorilla with a man to realise how man's intellect has enabled him to extend his sway over sound, and bend it to his service. The sounds which the man-like apes have at their disposal are limited, but man has evolved a number of sounds capable of an infinite number of combinations, and has made these sounds form a necessary part of his everyday life.

Words are but sounds or combinations of sounds, and by these sounds we are able to talk to each other, and convey the most delicate shades of thought and meaning. In the same way, music is made up of different sounds, and great composers are men who are able to combine these sounds together in such a way that they form beautiful, immortal harmonies.

During a fog, signals have to be laid on the railway line, to act as a warning to the driver and to caution him when to stop his train if there is danger at hand. [*L.N.E.R.*

HOW SOUND ACTS AS A WARNING WHEN DANGER IS AT HAND.

These are the two chief uses to which sound has been put by mankind. But there are others. When a clock chimes the hour we are making sound tell us the time. During fog we use sound to signal our trains when to stop or go forward, whilst on board ship or along the sea coast the strident voiced sirens wail out their noisy warnings. Sound in the form of bells tells us when our friends are waiting outside the front door to be let in, just as it can be made to warn us of the unlawful entry of burglars into our houses in the dead of night.

HOW SOUND IS CAPTURED FOR OUR USE IN DIFFERENT FORMS.

What is sound ? Just as there are waves of light and heat so there are waves of sound. The violinist drawing the bow across the strings of his instrument causes the strings to vibrate, and these strings thereupon give a little kick to the surrounding air, and a series of sound waves are created which convey to our ears the note played by the violinist. Now it follows that, if sound consists of vibrations of our atmosphere, there can be no sound without air, and that is perfectly true. There is no air on the moon, and because there is no air there is no sound. If all the high explosives on the earth could be piled in one huge lump on the surface of the moon, they would make no sound, even if we were able to explode them, because there would be no air to convey the sound to our ears.

Sounds also have different shapes. The sound " a " has a different shape from the sound " e," and " e " has a different shape from " i," and so on, and it is because sounds have these different shapes that we are able to get music out of a gramophone. When a piece of music is recorded the recording needle, vibrating to the sound waves of the music, makes different shapes upon the record. From this record other records are made, and when we put one of these on to a gramophone the needle, coming in contact with the different-shaped marks upon the record, is set vibrating, and in turn vibrates a drum which shakes the surrounding air, so that sound waves similar to those of the original music are set up, and we hear the different instruments just as the musicians played them.

Something very similar happens when we talk through a telephone. The sound waves or air vibrations which we make when we speak cause a thin plate to move in and out.

Electric power is used in the modern method of welding metals, formerly hammered together at the forge. The intense heat makes this task very uncomfortable.

This plate in turn varies the strength of an electric current which flows along the telephone wire, and which moves a corresponding plate backwards and forwards at the other end, so giving rise to sound waves which repeat what is being spoken into the mouthpiece. In wireless telephony the same thing happens, except that the connecting wire is dispensed with, and the sound waves, instead of being picked up by one person only, can be picked up by any number of listeners-in.

DID YOU KNOW THAT EVERY SINGLE THING IN THE WORLD IS MADE UP OF ELECTRICITY?

But of all the great forces of Nature which man is slowly bringing under his control, electricity is the most wonderful and the most inexplicable. Not so many years ago, no one knew what electricity really was, but now it is supposed that electricity is the primary form of all matter, that everything reduced to its most elementary state is electricity.

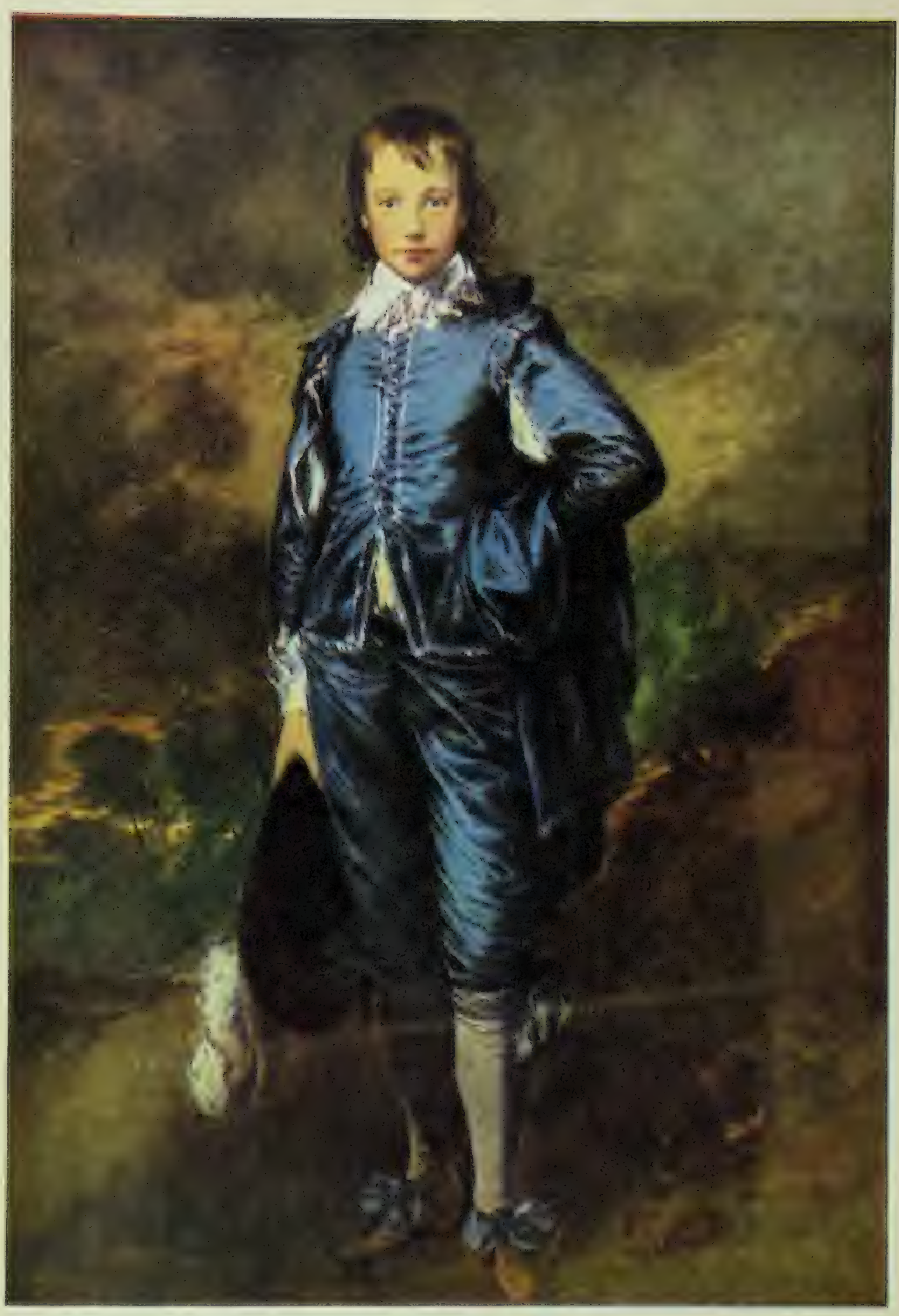
We shall understand this better if we start with the molecule about which something has already been said. These molecules are tiny particles of matter, and each molecule is composed of still tinier atoms which are so infinitely small that, if it were possible to place 100,000 of them side by side in a line, the length of that line would be less than the thickness of a cigarette paper. For a long time it was thought that in the atom had been discovered the most elementary form of matter, but now we know that the atoms themselves are made up of still tinier particles, called electrons, which revolve round a central nucleus at tremendous speed, so that each atom is something like a minature solar system with planets revolving round a sun. And the wonderful thing about these electrons is that they are electricity.

So you see that when all matter is reduced to its most elementary form it becomes electricity, and all the different forms of matter with which we are acquainted, gold, water, air, iron, our own bodies, every single thing in the world, consists of these tiny particles of electricity put together in different ways to form atoms, which in turn combine with other atoms, made up of a different arrangement of electrons, to form the molecules of the various forms of visible matter of which this earth is composed.

WHEN YOU PUSH A DOOR-BELL, WHAT HAPPENS TO MAKE IT RING?

All this will give you some idea of the immense force which scientists are trying to control when they harness electricity. An electric current is a stream of electrons. If you stand a score of bricks on end touching each other, and then give the first brick a push, the whole line will fall over, though the brick which you pushed has hardly moved any distance at all. Something like this occurs when an electric current passes along a wire. When this is done what really happens is that electrons pass from atom to atom at amazing speed, each atom as it receives an electron giving off an electron which flies to the next atom until the end of the wire is reached, and a bell is rung, or the current made to perform whatever function it is intended it should do.

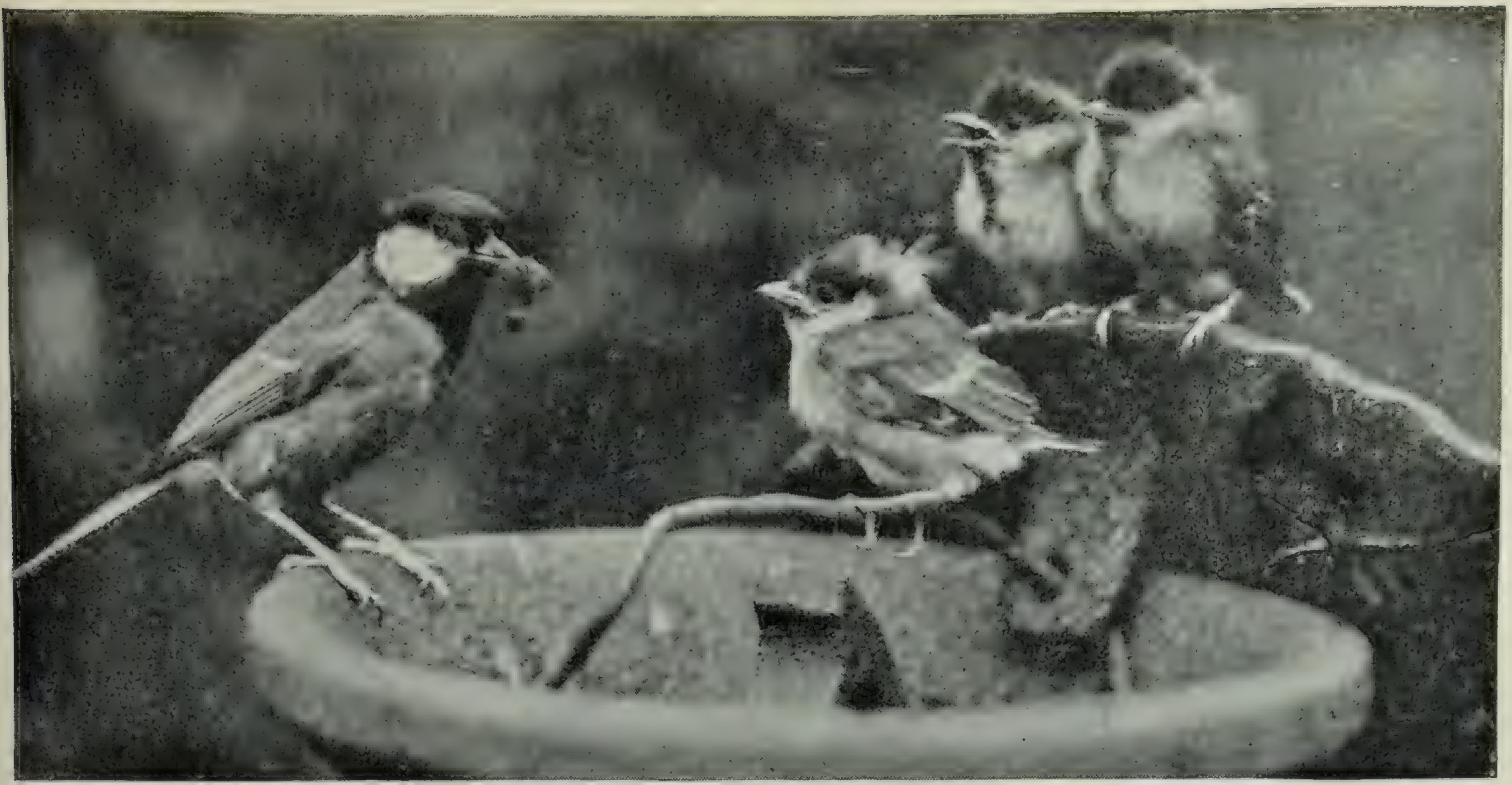
We do many things with electricity nowadays. We light and warm our homes, drive our trains and the machinery in our factories ; yet man has but touched upon the fringe of the mighty power which lies harnessed in the tiny atom. One day, no doubt, he will learn how to utilise the immense energy which lies dormant in a brick, or a stone, or a piece of coal, and a new age of undreamed-of wonders will dawn upon the world.



THE BLUE BOY.

Thomas Gainsborough (1727-1788) practised drawing even as a small boy in Suffolk. He became one of the thirty-six original members of the Royal Academy. His picture of Master Buttall, known as " The Blue Boy," was sold to an American collector in 1921 for £150,000.

Facing page 373



Little Oliver Tit asks for more! The Great Tit finds it difficult to supply the wants of his hungry family. [*R. McLeod*

BUSY MOTHER NATURE

By PROF. SIR J. ARTHUR THOMSON

Sir J. Arthur Thomson, one of our greatest authorities on Natural History, wrote this introduction specially for you only a few days before his death. He loved Nature all his life, and here he tries to show you how Mother Nature keeps the world continually going ahead.

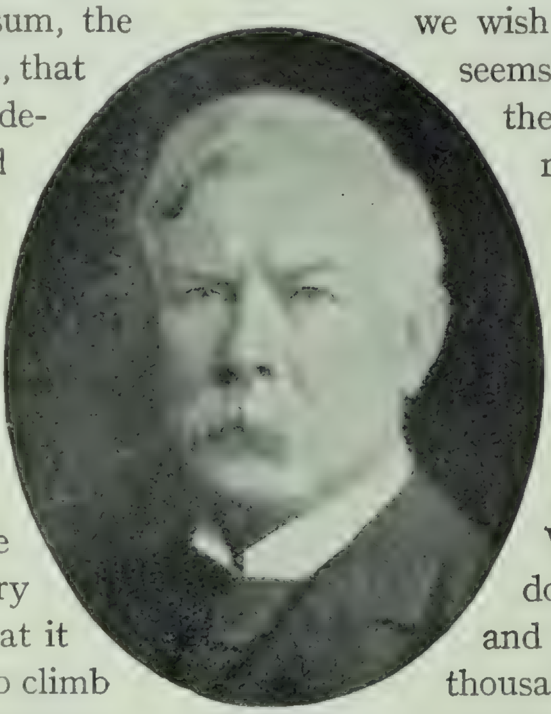
THE twofold work of Living Nature is caring for self and caring for others; and half of the latter is *mothering*. Summer is in the main the season for work, when green plants manufacture most of their food-materials, such as sugar, and when animals are most industrious. Autumn is in the main the season for storing and for making ready for the winter, which is the time for resting and lying low. It is in Spring that we see mothering, and there is nothing more beautiful.

Take a look into our spring picture-gallery. There is the "feather-poke" nest of the Long-Tailed Tit, sometimes made of two thousand feathers with moss and lichens outside. The roofed-in door is near the top, and through it the little bird dives into a quilt, where the eggs are hatched and the young ones fed. It is not only a very beautiful cradle, but very perfectly suited for its purpose. Sometimes it is used as a shelter in winter, so that it is on the way to becoming a home.

A second picture, as different as we can think of, is the cocoon of a heather spider which the mother carries about underneath her body, fastened on with threads of silk. Inside it there are a few eggs, as safe as safe could be, and by and by they develop into miniature spiders which the mother carries about until they are ready to leave their cradle and begin to fend for themselves.

Another picture is of a Madagascar crocodile who is wandering to and fro along the muddy side of a slow-flowing stream. What has she to do with mothering? The answer is not far to seek, for she is waiting for the hatching of her eggs which she laid many weeks before in the mud and fermenting mould of the riverside. It was warm enough to allow of the development of the young crocodile inside the egg, and it was safe enough from the hungriest enemy eyes. But would it not be an awkward place to be born in, over a foot below the surface? So the mother is waiting to dig them out, and as she must not be too soon, before they are ready to hatch out, nor too late, for then they would be suffocated, she has her ears open to detect the little piping sound that her offspring make—just when they are ready! Out of the egg there scrambles a fully-formed little crocodile, almost the length of our hand when it straightens its body, and after it is unearthed it does not ask for much more mothering.

We are picking and choosing in our mothering gallery, and the next picture we linger over is that of the Virginian Opossum, the only North American Opossum, that holds its own in spite of the demand for its delightful fur and its palatable flesh. It is a picturesque mother, and has three quite different ways of looking after its two large families in the year. The Virginian Opossum is born a pygmy, just a little over an inch long, and then it is, like most pouched mammals, very helpless. There is one thing that it can do, however, and that is to climb hand over hand, as best it can, into its mother's skin-pouch. Here it is fed by its mother's milk until it can fend for itself. It is so small and weak that it has no power to take the milk provided, so the mother squirts the precious milk down its throat! There is a simple arrangement for keeping the milk from "going down the wrong way."


Professor
Sir J. Arthur Thomson

Inside the pouch, which we may call the second cradle, there are often seven young ones, and there may be more. The youngsters enjoy the food and shelter of the pouch for a couple of months, and then they begin to look out at the door into a world of which they had just a glimpse when newly born.

Then they venture out and make excursions for weeks over their mother's body, holding on to the hair, and occasionally with their tails round their mother's. But they go back again to the pouch when they are hungry or when they are frightened, and the quaint double life may continue for a couple of months. Then the mother weans her babies and soon begins to have another family. A few of the marsupials have no pocket at all, and Azara's Opossum, about the size of a cat, has been seen climbing a tree with eleven rat-sized youngsters on her back.

It would be interesting to linger among the hundreds of pictures of "busy mothers," but we wish to state a general idea that seems to us to clear up our view of the world of life. For deep, deep reasons there is dying away among plants and animals, and the race is continued by *mothering*. Life is a trend towards more life—we would define it as *the urge for more*—and it cannot get on without mothering. What is it that the mother does? She starts a new life, and we must not forget the thousands of plants that mother next year's seeds in the kindly season of the summer before. But the mothers do more than start development, they busy themselves with *fostering* during the time before the young creature is nearly ready. Thus the Surinam Toad actually fosters its tadpoles in little skin-cradles on its back, while the mother Fiddler-Crab carries her pinhead larvæ in a basket beneath her tail, and wafts them from time to time to and fro in the shore water. Then, there is in the third place *nurture*—a word that may be used to include the bird patiently brooding on her nestlings, the otter teaching her engaging youngsters all the alphabet of woodcraft, or the burrowing wasp collecting juicy caterpillars for its larvæ. What a wonder is Nature's busy mothering; it makes the whole world more full of meaning.

J. Arthur Thomson

THE ROUND OF THE YEAR

WHEN SPRING UNLOCKS THE FLOWERS

Nature's wonders are never-ending, and the round of the seasons has continued all through time. Springtime and harvest, sunrise and sunset, bud, leaf, blossom and fruit or seed—so the work has run. The section now to follow takes us through the twelve months from early spring to the last chill blast of winter. We shall hear of the year's awakening, and the bursting into life of garden, meadow, hedgerow and woodland. The little creatures of the wild will enter our story—and so we pass to summer days of sunshine and fullness. Then autumn tinges the trees with gold and whirling gusts heap up the fallen leaves. Winter descends, and the world of Nature sleeps at last—a sleep, however, that shall end when spring calls once again to waken her children from their rest.

WE need never feel dull in the country. No matter how often we walk down the same lane, over the same fields, or through the self-same woodland paths, there is always something new, something fresh to see. All the year round, from the first warm breath of Spring till Winter blows its last icy blast, we shall always find something to delight and interest us in the country.

But when does Spring begin? Well, the Almanack tell us " Spring begins on the 21st of March." But Dame Nature takes no notice of such hard and fast rules. Much earlier than that many of her children are stirring, peeping out to see if stern old Winter has gone.

But Winter has no intention of being hustled away by young Spring so early in the year. For weeks yet to come they will struggle for the mastery. Bright gleams of sunshine are quickly followed by showers of sleet and icy blasts, but little by little old Winter is forced to give way, gradually the days lengthen, the Sun grows stronger, winds grow softer—Spring at last comes into her kingdom. Then, almost at once, Nature's children wake up and joyfully prepare for the fun and the labours of Spring and Summer.

There is bustle and excitement everywhere. Everywhere new life, new growth, is springing up. Day by day, as Spring advances, the Sun shines brighter, trees shake out their green leaves, new singers join the joyous bird chorus —all the world is busy and gay.

Down in the orchard, in a sheltered corner of the garden, or hiding under a hedge on the borders of a little copse, we find the first Snowdrops of the year. Brave little flowers they are, coming out so early.

The Snowdrop hangs its head not only because it is too heavy for the slender stem to carry erect; within the little bell is a precious store of golden pollen with which the tiny seeds of the flower must be set; and the drooping petals of the Snowdrop form a little tent, protecting the pollen from the cold wind and rain that are sure to come so early in the year.

Another early Spring flower, one of the first of the woodland flowers, is the Lesser Celandine.

When the Primrose smiles at us, we know that Spring has arrived and that many flowers will soon be in bloom.

It is something like a Buttercup, but has seven, eight, or sometimes as many as ten golden petals, instead of the five which all true Buttercups have; while its glossy leaves are shaped rather like hearts.

It is in the woods and dells and sheltered nooks that we must look for the earliest Spring flowers: Snowdrops, Celandine, Primroses, Sweet Woodruff, Violets, Anemones, and later on the Bluebells, or Wild Hyacinths, that cover the dark ground with a wonderful carpet of blue. For in such places the tall trees, the thick bushes, or the steep banks protect the tender young plants from the full force of the gales of wind and rain that are almost sure to come in the early days of Spring. Woodland plants, too, have no time to lose; they must make haste to grow and flower and set their seeds before they are shut out from the bright rays of the sun by the masses of green leaves that will cover the trees and shrubs later on.

HOW SPRING BRINGS LIFE AND COLOUR TO THE WOODLANDS.

Although we cannot see the sap rising, and as yet no green leaves are seen on the boughs, there are signs of Spring in many of the trees quite early in windy March.

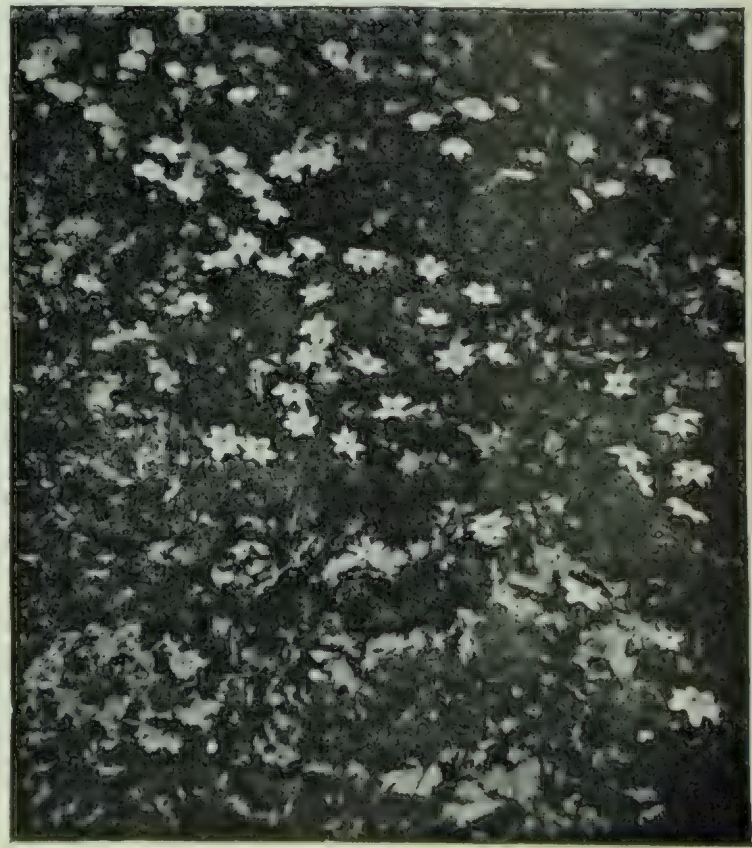
The Hazel, the Alder, and the Elm have already hung out their funny-looking catkins. Indeed the Hazel is in such a hurry to flower and set its seeds that it cannot wait until Spring has come, it gets its catkins ready in the winter-time, when we may see them, looking rather like tiny, stiff brown sausages, growing in little clusters on the bare twigs.

A few warm, sunny days in February, or even in January, will encourage some of the impatient catkins to grow and show the bags of yellow pollen tucked away beneath their tiny brown scales, and when Spring really does arrive, the Hazels are among the first of the trees to greet her. At once all their branches are crowded with catkins hanging down like little tassels and swinging merrily in the breeze. These catkins are really clusters of tiny pollen flowers, each one sheltering under a little brown scale which protects the precious pollen from the rain and sleet; and, as the catkins are tossed about by the wind, the dry, yellow powder is shaken out and whirled away in clouds.

HOW SEEDS ARE SPREAD AND SCATTERED THROUGH THE WOODS.

Besides the long catkins the Hazel has another kind of flower, standing erect on the under side of the twigs. They are very small, and look like plump little buds crowned with red feathery tufts. These are the seed flowers, and as the pollen from a neighbouring Hazel tree is blown past by the wind, it is caught and held fast in these feathery tufts, in order that the tiny seeds within the flower may set and ripen, and in time grow into the sweet Hazel-nuts for which we go nutting in September.

Most of the woodland trees—the Beech, the Oak, the Pine, the Elm, the Birch, and the Ash



Wood Anemones, which flourish in sheltered nooks, form a dainty carpet of early Spring flowers.

—depend upon the wind to carry their pollen from one to another.

The Elm and the Alder quickly follow the Hazel in shaking out their catkins, the Beech is not far behind, but the proud and stately Oak will not be hurried. Spring is far advanced and most of its neighbours have already shaken out their leaves before the Oak shows signs of awakening to life. Then a soft ruddy glow spreads over all its outstretched branches, quickly changing to gold and green as the delicate catkins hang down like strings of golden beads from all its branches, while at the same time the pale green leaf buds begin to unfold.

BEAUTIFUL LITTLE BLOSSOMS OF GAY COLOURS SPRING TO LIFE.

It is May before the dark Fir trees are showing their new flower-cones, which stand upright on the branches like little green candles on a Christmas tree ; while the catkins hanging down below pour out such quantities of pollen that the ground beneath the trees is often quite yellow with it. As the Fir trees and the Pine trees keep their foliage all the year round, the flowering cones and the leaves are on the branches at the same time, but the leaves are so fine and needle-like, they do not overshadow the little cones and keep them from getting their supply of wind-blown pollen.

The delicately-tinted Apple Blossom looks like a ray of sunshine. It is easily swept away by the breeze.

Sturdy little Hazel catkins swinging gaily and scattering their pollen for the breeze to carry in all directions.

March passes. April with its gentle winds, soft showers, and bursts of warm sunshine takes its place ; and soon the orchards will be all white and pink with the blossoms of Cherry, Apple, and Pear. Very different are these orchard flowers from the dry little catkins of the trees in the wood. Here are bright petals, sweet scents, and honey in plenty for the bees, who flock eagerly to such a rich feast.

HOW THE BIRDS BEGIN TO PRACTISE THEIR SPRING SONGS.

All through the cold dark days of Winter our little feathered friends of the countryside have had a hard time. But birds are brave, cheery little folk, and when at last Spring is really on the way who so happy and joyous as they.

The Starling has been talking about it ever so long ; perched up high on top of a chimney-pot he has warbled and whistled about the sunny days to come.

The Thrush began practising his Spring song soon after Christmas. The Blackbird, too, has been trying over little runs and phrases so as to be ready for the great Spring chorus in which all the birds take part. A little later the home birds are joined by our summer visitors, who come to us from over the distant seas.

The Song Thrush is one of the first of our home birds to start nest-building. Soon after Valentine's Day (when country folks say that birds choose their mates) Mr. and Mrs. Thrush begin to prepare the beautiful little nest that is to be the nursery for their baby birds. Backwards and forwards they fly, fetching dried grass-stalks, fine twigs, and tough, flexible rootlets. These they twist and weave into a small round basket ; working away with beak and claw, pulling and tugging at a stiff twig or troublesome rootlet that will not stay in place, until they are satisfied with it.

HOW MOTHER THRUSH BUILDS A WARM NEST FOR HER CHILDREN.

Now the neat little basket is finished, but the nest is not yet complete. The birds now begin lining it with a mixture of mud and rotten, powdery wood, plastering it all over the inside of the nest with their beaks ; while every now and then one of the birds will get inside and turn round and round to smooth the walls with its breast, to make sure that there will be no rough humps and bumps that might hurt the tender baby birds.

This lining, when it is finished, sets as hard and firm as cement, and is as smooth and round as a little basin.

In this wonderful little nest Mother Thrush lays four, five, or sometimes six little eggs. They are the most beautiful blue, ornamented with black or dark red splashes—and here we hope they will be safe and sound until the little thrushes are hatched.

Our friend, Robin Redbreast, and his wife usually build in a bank in a hedgerow, or in a hole in an old wall. Their little nursery is a neat little nest made of moss and withered leaves, softly lined with hair and feathers. The eggs are white, sometimes just speckled with red.

TINY BUILDERS GET BUSY IN THE WOODS, MAKING THEIR SUMMER HOUSES.

The Blackbird's nest is rather like the Thrush's, but instead of the smooth cement lining it has just a layer of mud to bind the twigs, moss, and leaves firmly together, and is finished off with a soft lining of grass. The nest is generally placed deep in a hedge or in the middle of a thorn-bush, and the eggs, four to six in number, are a bluish green in colour, speckled all over with reddish brown.

The Blackbird eats lots of grubs and insects, and so does a great deal of good in our gardens and orchards.

The Chaffinch makes the most beautiful little nest in the branches of an old mossy apple-tree, or in a hedge, in a bramble-bush, or sometimes in a thick tangle of ivy growing on an old wall.

The nest of the Long-tailed Tits is even more wonderful. As big as a coconut and very much the same shape, it is often fixed in the forked branch of a tree, or it may be in the middle of a prickly furze bush or in a tangle of brambles. The outside of the nest is covered all over with grey lichen, and from a little distance the nest looks only like part of a broken, overgrown bough.

Except for the tiny Goldcrests the Long-tailed Tits are the smallest of our British birds. The Great Titmouse and the Blue Titmouse are much more common, but neither of these birds makes such a wonderful nest as the Long-tailed Tit.

A very different kind of bird is the little Wren—a tiny, shy thing, that pops about under the bushes and piles of brushwood as quietly as a little brown mouse. Although his dress is not gay, the Wren is really a pretty little bird. He looks so neat and tidy in his brown feathery coat, while his bright eyes and short turned-up tail give him quite a perky air.

FEATHERED TRAVELLERS RETURN FROM THEIR WINTER HOMES.

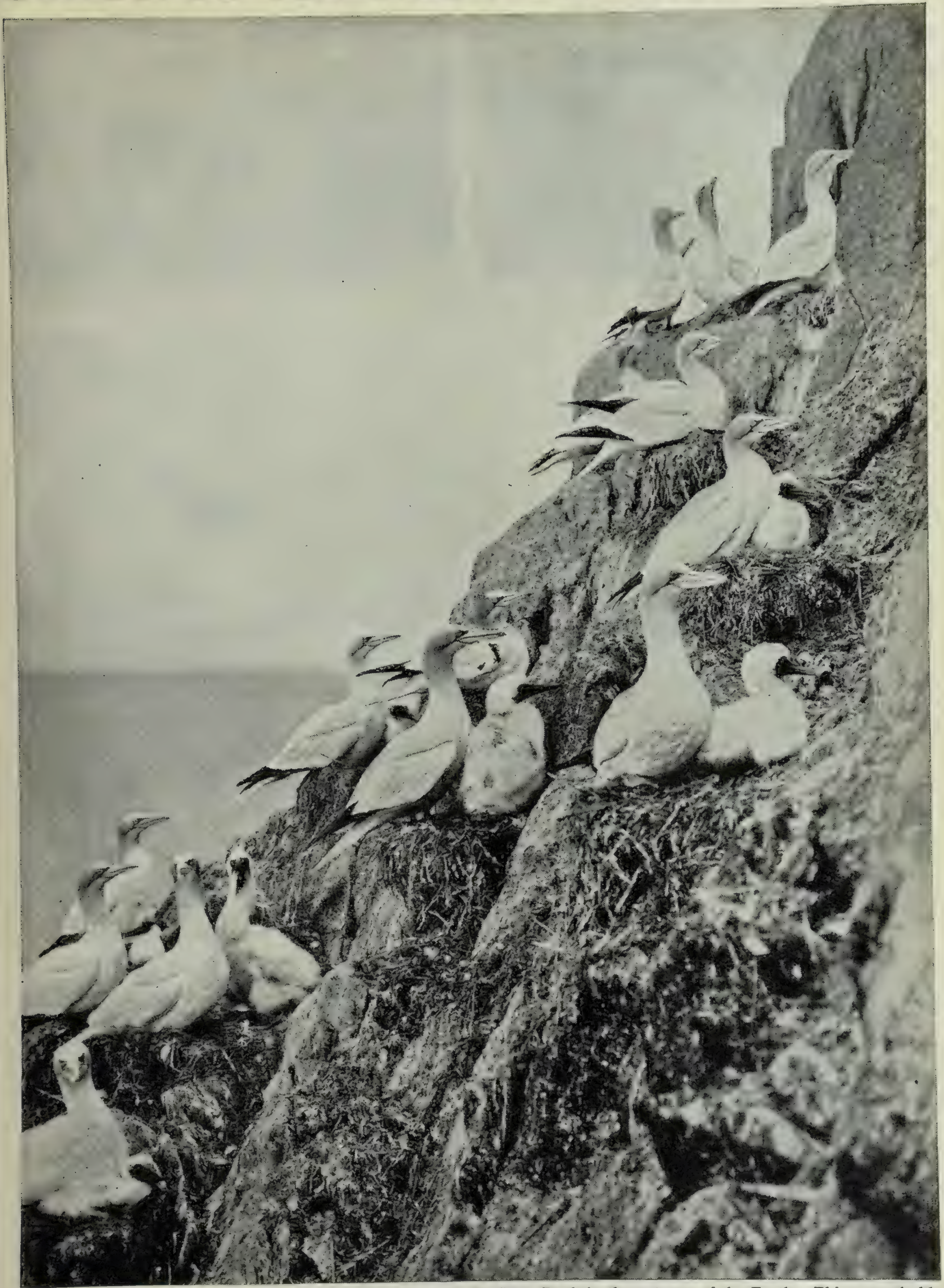
For so small a bird, he has a surprisingly loud song. His nest of moss and leaves and fine dried grasses has a tiny hole in the side for a doorway and is lined with lots of soft feathers and hair ; and it is always placed in some spot where it is well hidden from the eyes of passers-by.

The tiny Goldcrest, or Gold-Crested Wren, is the very smallest of our British birds, and is a lovely little thing with yellowy feathers and the little gold crest on the top of its head. Its tiny nest of softest moss and wool, bound together with spiders' webs, hangs like a fairy's cradle from the end of a bough, rocked to and fro by every passing breeze.

When March winds give place to April showers, we may look out for the return of the little feathered travellers who come to us every year from distant lands across the sea—some from Africa, others from India and China.

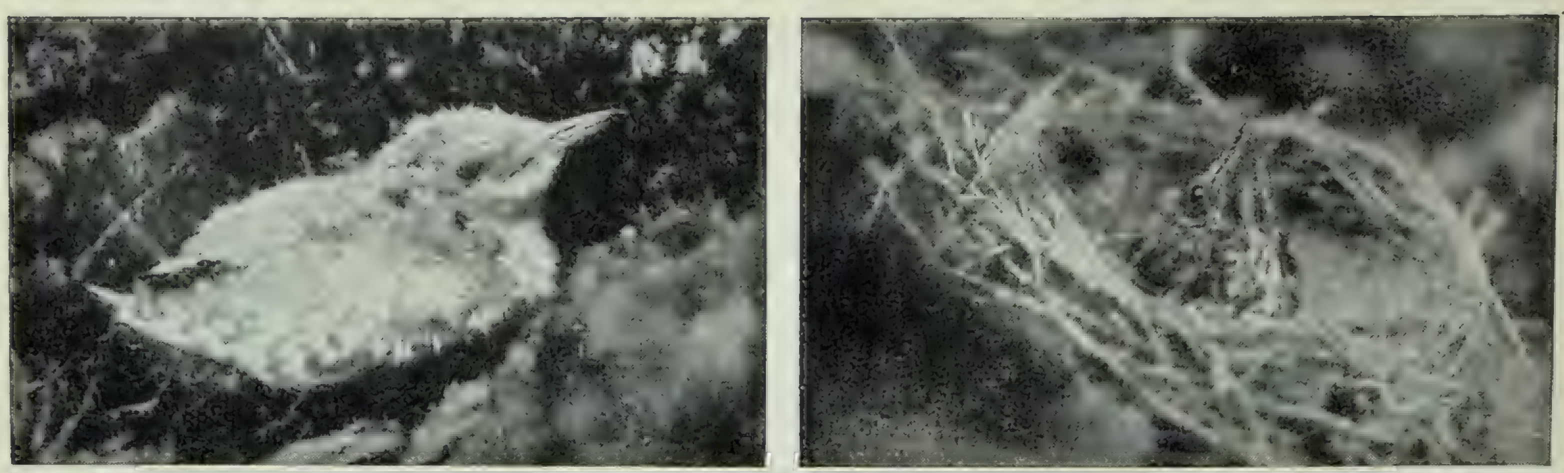
Year after year the Swallows and the Martins will come back to the same place, quite often making their nests in the very same spot where they reared their little families the year before.

GRACEFUL SEA-BIRDS ON THEIR NESTS



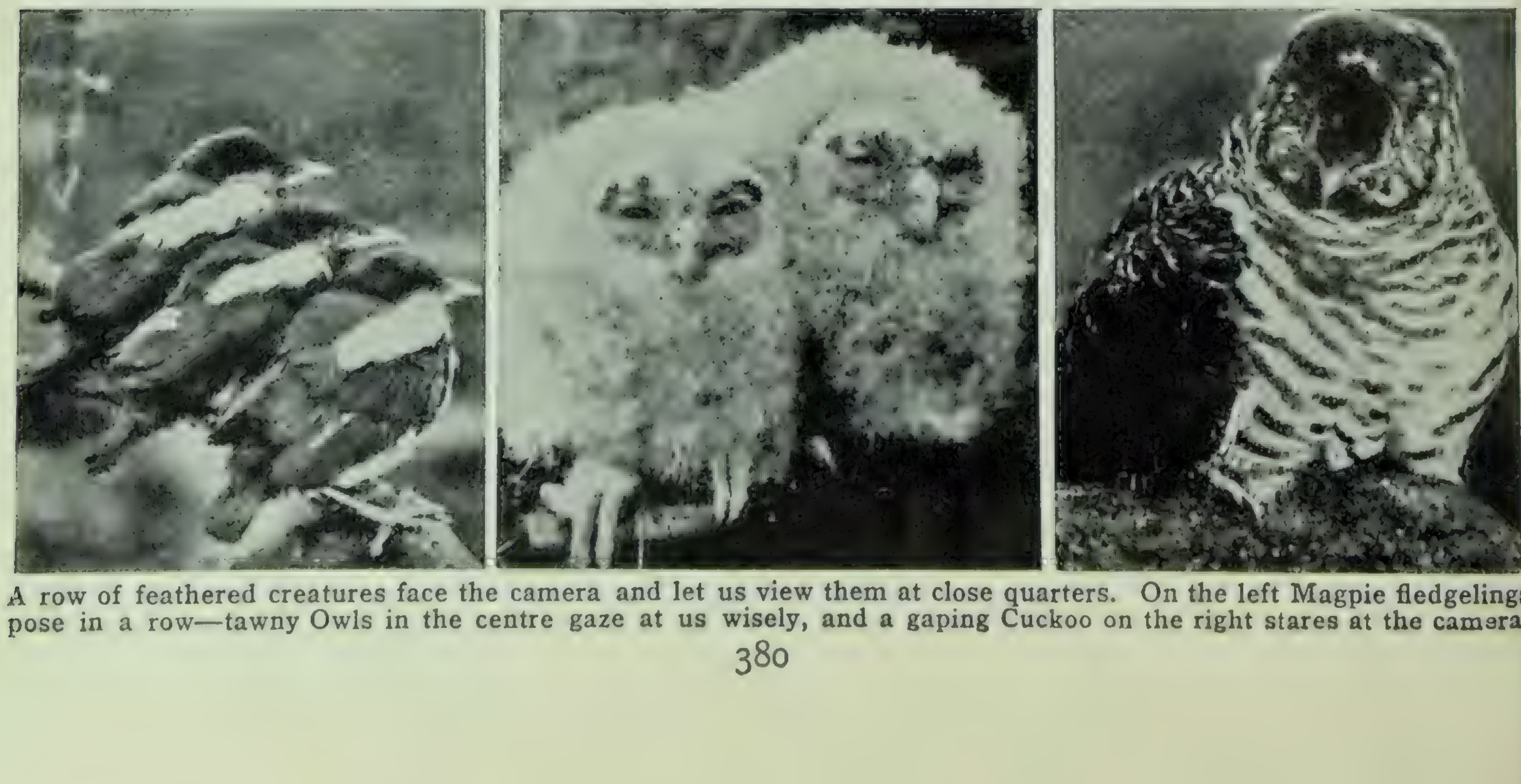
The Gannet or Solan Goose is found in large numbers on the Bass Rock in the estuary of the Forth. This remarkable photograph shows these birds, who feed on herrings and pilchards, on their nests. The Gannet is nearly three feet long. Their plumage is white with some black feathers on the wing and a yellowish tinge on head and neck. [*Photo: J. Williamson*

SOME CLEVER CREATURES OF THE WILDS



On the left, a young Tern looks out on the world, and wonders if it is going to prove a nice place to live in. On the right, singing gaily from her nest, is a Thrush, one of the sweetest songsters of the woods.

The sly Fox creeps stealthily out on his nightly prowl in search of unwary rabbits, fowls, and even lambs. The Grebe, on the right, is a very uncommon diving bird. It frequents lakes and ponds in summer, and goes to sea in winter.



A row of feathered creatures face the camera and let us view them at close quarters. On the left Magpie fledgelings pose in a row—tawny Owls in the centre gaze at us wisely, and a gaping Cuckoo on the right stares at the camera.

Although Swallows and Martins are very much alike, it is quite easy to tell which is which. Both have long narrow wings and forked tails, but the Swallow is the bigger bird of the two, and its wings and tail are longer.

Swallows always build their nest inside some building, such as a barn or shed. The Martin makes its nest out of doors, under the eaves or window ledges of our houses.

Sand Martins are smaller birds, clothed in dull brown feathers instead of dark blue. They make their nests in holes in the side of a cliff, a steep bank, or sometimes in a railway cutting.

It is May, as a rule, before the Swift, or Black Swallow, appears on the scene. The Swift is not a true Swallow, although he is very like one in appearance. His nest is a very simple affair, made of wool, feathers, straw and grass, which the birds collect while on the wing without alighting on the ground.

MISTRESS CUCKOO: THE BIRD THAT IS TOO LAZY TO BUILD A NEST OF HER OWN.

Sometime between the tenth and the twenty-first of April, when all the woods are growing green, we shall surely hear the loud triumphant call, " Cuckoo ! cuckoo ! " to tell us the Cuckoo has come home again.

Neither the Cuckoo nor his mate have any idea of building a nest and bringing up a little family like other birds. Yet they do not want their children to die of neglect. So they make other birds hatch their eggs and bring up the young Cuckoo.

When both the little owners are away at the same time, my lady Cuckoo slips quietly up to a nest, quickly picks up one of the eggs in her bill, drops it over the side of the nest, and pops in one of her own instead.

She lays from fifteen to twenty eggs in this way, putting each one into a different nest, and always choosing the nest of a small bird, such as the Willow Wren, the Meadow Pipit, the Robin, or the tiny Hedge Sparrow.

The little mother bird sits patiently on the eggs—her own and the Cuckoo's—until they are all hatched. The young Cuckoo is, of course, much bigger than the other fledgelings. Almost at once, even before its eyes are open, it begins to behave strangely. It shuffles about, pushing and jostling the other nestlings until it succeeds in hoisting one of them on to its broad back. Then, with a sudden heave it tips the poor little thing over the side of the nest.

This performance the Cuckoo repeats again and again, until it is left alone in possession of the nest

All through the spring and early summer the foster parents take care of, and feed, this lazy Cuckoo, for the bird makes no attempt to do anything for itself until it is almost full grown.

THE FUNNY LITTLE FELLOW WHO WEARS A VERY PRICKLY COAT.

As we come home through the woods where we have spent a happy afternoon picking Primroses, we may, perhaps, hear a little rustling noise among the crisp, dry leaves, and presently out waddles a funny little Hedgehog, zig-zagging from side to side, and making a little snuffling noise as if he had a cold in his head. Ah ! He has seen us. And at once Mr. Hedgehog tucks in his paws and his nose and his tail, and rolls himself up into a round, prickly ball. Though he does not care to fight, the Hedgehog is quite well able to defend himself. At the first sign of danger he turns himself into a prickly ball which few animals are brave enough, or foolish enough, to attack.

Now the brisk little Squirrel that lives up aloft is just the opposite in every way to the slow-going little Hedgehog who waddles about on the ground below. The Squirrel loves light and air and sunshine. He is climbing and leaping and skipping about from morning until night.

The Squirrel's nest is called a " drey." It is a large substantial affair made of twigs and leaves and moss, and is generally placed high above our heads in a fork of a tree, or sometimes in a hole in a tree trunk.

The Squirrel has very strong, sharp teeth, with which he cracks nuts and gnaws through the hardest fruit-stone to get at the kernel ; and a big bushy tail which helps him to keep his balance when he is bounding about up in the tree-tops.

HOW MOTHER RABBIT LOOKS AFTER HER LARGE FAMILY.

Rabbits are not a bit like our little friend, Red Squirrel, in their ways. They are fond of company, and a great many generally live together in a " warren." This is a regular underground town, with a main street, or tunnel, and side streets branching out in all directions.

The babies are not in the warren. Wise Mother Rabbit scrapes out a little nursery for them in some sheltered corner, under a bush, or among the roots of an old tree, where she makes a lovely soft bed for her babies to lie upon out of her own soft fur. Baby Bunnies

The funny little Mole is always busy burrowing underground with his spade-like paws, hunting for food and gobbling up worms and grubs with keen appetite.

need a very warm bed, as when they are born they have no fur of their own to cover their tender little bodies.

Just over the hedge on the edge of the common, some other furry babies, very much like the little Rabbits, are just beginning to "sit up and take notice"—gazing with their big golden eyes through the tangled grasses and dried bracken stalks out on the strange big world in which they find themselves. These are the little Hares, the prettiest and most delightful of all wild babies.

WHEN IS A HARE KNOWN AS A LEVERET? WHAT IS A HARE'S "FORM"?

"Leverets," as young Hares are called, have no cosy nursery. However, they are strong, hardy little creatures, and when they come into the world are already dressed in warm fur coats. So they do not mind being left out of doors all day and all night, and Mother Hare keeps her eye on her babies, going round to all in turn to feed them and make sure that they are all safe and sound.

When the young Hares are about a month old they are big enough and strong enough to look after themselves. They are able to jump about and nibble the grass, and no longer need their mother's care; so the Hare leaves her children, and each one starts out alone to seek its fortune.

Hares are very independent animals. They like to live by themselves, and do not make burrows and live together in large companies as Rabbits do. Each Hare chooses a particular spot under the open sky for his home, and there he lies quietly resting during the hot hours of the day.

This spot is called the Hare's "form." In appearance the Hare is very much like a Rabbit, but it is a larger animal with longer ears, and stands higher on its legs.

WHAT QUEER CREATURE IS CALLED "THE LITTLE GENTLEMAN IN VELVET"?

The Farmer does not look with a friendly eye on Mr. Hare and Brer Rabbit. But they are not the only wild beasties that trouble him. Down below the ground the funny old Mole tunnels about in all directions, flinging out little heaps of mould as he goes, making humps and bumps all over the tidy fields, and disturbing the roots of plants and grasses.

The Mole's fortress is a good-sized room hollowed out under an extra large mole-hill. It has several entrances and round it is a regular maze of underground passages and galleries, which he digs at a furious rate.

The Mole does not work like this just to amuse himself. He is really hunting for food and gobbling up all the worms and grubs in the earth as fast as he can find them. For this poor little creature is always most dreadfully

When we see young Lambs scampering gaily in the sunshine we know that the earth has wakened to life.

hungry, he never can get enough to eat; indeed, if the Mole were kept without food for more than ten hours he would die of starvation.

Everything about the Mole is "just right" for the strange underground life he leads. His plump little body, shaped like a well-stuffed bolster, is covered with fur so short and smooth that is is just like velvet, and does not cling to the sides of his tunnels as he hurries through them. His little pink snout is long and narrow, making a most excellent tool for burrowing in the ground; his forepaws are broad and flat like tiny hands, and each of his ten fingers is armed with a sharp, strong claw.

WHAT CREATURE CAN FLY LIKE A BIRD BUT IS COVERED WITH FUR?

The Mole is not blind, as people used to think, though his eyes are very small and he is rather short-sighted, but as he lives almost always in the dark, this does not trouble the "little gentleman in velvet."

In the winter he stays at home in his fortress and keeps himself warm and comfortable by rolling himself up in a bundle of grass and dry leaves, which he has dragged down into his house. There he sleeps soundly no matter how cold it may be in the world above his head.

It is April before the little Dormouse makes up his mind to wake up and leave the cosy nest where he has been sleeping his wits away all the winter.

The Dormouse looks very much like a tiny Squirrel, though his coat is not so dark, and his tail not quite so bushy, and he is altogether a much plumper little person. He eats all kinds of seeds and berries, and is particularly fond of hazel nuts.

Another little mouse-like creature is the Bat. A Bat is the most surprising little animal—the only four-footed creature that is able to fly. It has wings, yet is not a bird. Its body is not covered with feathers, but with soft fur. Indeed the little "Flittermouse," as the Bat is called in the country, looks just like a mouse with a large pair of wings.

THE QUEER CREATURE WHICH SLEEPS THROUGH THE DAY AND FLIES BY NIGHT.

A Bat's wings are not at all like the wings of a bird. The little creature has enormously long, bony fingers joined together by folds of fine leathery skin, which is stretched between them like the web of a frog's foot.

When a Bat flies its fingers are spread widely apart like the ribs of an umbrella, keeping the skin stretched out tightly between them; and it folds its wings simply by bringing its fingers close together again.

The hind legs of a Bat are almost as strange as its front pair of limbs. They are very short and joined to its long tail by a fold of skin; so the Bat cannot walk very well, and is by no means nimble when on the ground. With its wings folded back it shuffles along most awkwardly—you would hardly think that it could be the same little creature that flits so gracefully through the air.

Pond skaters are among the "small fry" that dwell in the pond. Their long, thin legs are as fine as thread.

But the Bat does not often walk about on all fours. In the day time it creeps into some dark corner, up among the rafters of an old barn or under the eaves of an old house, and there it hangs itself up head downwards by its hooked claws, and goes to sleep. Then in the twilight it creeps from its perch and stirs to life, and we may see it flying about in swift zigzag dashes chasing the flies, moths and little beetles that also come abroad in the evening.

The white Butterfly pauses to rest on its fluttering journey.

The Bee busy sucking the sweetness from the flowers.

Before the happy spring-time slips away we must visit the ponds and streams, as all sorts of exciting things are going on there.

If we look down into the water, we shall see that it is full of tiny living things. There are quantities of " small fry," as baby fishes are called, only just hatched. Paddling its way through the water comes the Water Boatman (a beetle that swims on its back and uses its long hind legs as oars) ; while absurd-looking Pond Skaters, that look just like tiny pieces of stick with long, thin legs as fine as threads, skim here and there over the surface of the pool.

Down at the bottom of the pond are some queer-looking things with long cigar-shaped bodies and round, knobbly heads, which will one day change into beautiful, glittering, gauzy-winged Dragon-flies.

Several other insects besides the Dragon-flies spend the first part of their lives as " water - babies," including the swarms of tiresome little Gnats that dance so gaily over every pool of water which is not clean and clear.

In June the Golden Honeysuckle delights us with its fragrance.

Quite early in the spring-time, in nearly every pond and stream and ditch, we are sure to find some lumps of pale jelly full of tiny black specks. These, as I dare say you know, are masses of Frogs' eggs.

The specks grow bigger, gradually turning into funny little Tadpoles with big heads and long tails, and then into tiny frogs.

No sooner does spring return, than hosts of busy insects at once begin to make their appearance.

Where have they all sprung from so quickly? In the winter there was hardly an insect to be seen.

Many insects die in the winter, of course ; but, either as eggs or grubs or full-grown insects, some manage to survive to carry on next year.

One of the first Butterflies to appear is the Brimstone Butterfly, like a very large primrose blown along in the wind. Then the Tortoise-shell Butterfly comes out from its hiding-place, and the Peacock Butterfly is not far behind. These last year's Butterflies soon die, but others come to take their place. Those that have spent the winter tucked up in wind and rain-proof chrysalis cases now come forth, shake out their delicate wings, and sail away as bright new Butterflies —white, blue, or many-coloured.

The Hive Bees also wake up very early in the year. As soon as they are quite sure that winter has gone, the Bees set to work.

While some are busy indoors, others go out whenever the sun shines to fetch in provisions, which are sadly needed in the hive, for by the end of the winter the store cupboards are almost empty.

So the spring passes. May comes to find a bright and busy world; all Dame Nature's children rejoice in the warm, soft, sunny days.

Spring is passing, but summer is coming.

Hark, from the tree at the edge of the wood comes a cheerful call, "*Cuckoo*! cuckoo!"

SUMMER SENDS A GLOW OVER THE BUSY EARTH

JUNE is one of the best and brightest months in the year. Birds sing from sunrise till long after sunset, and when other birds are silent the Nightingale is still pouring forth his wonderful song—far into the night.

June, too, is *the* month of all the year for flowers. The May is over but the hedges are gay with Wild Roses, pink and white, sweet-scented Honeysuckle, and Blackberry blossom.

HOW PESTS ARE DESTROYED TO SUPPLY BIRDS WITH FOOD.

On every sunny morning, if we listen, we shall hear the humming and buzzing of insects. They are everywhere. Big velvety bumble bees dive head-first into the Foxglove bells. Butterflies, blue, white, yellow, and many coloured, like Joseph's coat, hover about the flowers or chase each other in the air high above our heads; and as for caterpillars and other creepy-crawly insects, they are just everywhere.

But, luckily for us, while the insects feast upon the plants, the birds feed on the insects. If it were not for their help in destroying so many harmful pests, nearly all the plants would be eaten up.

All the small furry beasties are glad that the Summer has come, and in the meadows the cows are pleased to crop the sweet grass, or to lie down lazily munching—chewing the cud, as we say.

The pretty little Bush-Vetch with its reddish-brown colouring grows on hedgerows and in the meadows.

The dainty Meadow Vetchling struggles up among the grasses, adding a bright splash of colour to the earth.

Summer is a busy time as well as a happy time for everyone. So let us try to learn something of the way in which Dame Nature's children spend the Summer days.

HOW PLANTS WORK HARD TO KEEP THEMSELVES ALIVE.

I dare say you are surprised to hear that plants work, and you are wondering how they do it. Well, let us just think what a plant really is. It is a living thing. It eats, drinks, sleeps, feels and works just as we do ourselves, although not quite in the same way.

Every part of the plant has its own work to do. But the chief workers are the green leaves. It is their duty to supply the plant with all the food it needs.

On the underside of the leaves are hundreds of tiny mouths, which, whenever the sun is shining, suck in a kind of gas called carbonic acid, which is always floating about in the air.

Inside the leaf the carbon is separated from the gas; and, with the water sent up by the roots, it is changed into starch, sugar, oil, and

Meadow-sweet, a thirsty little plant with a strong, sweet scent, is to be found in damp, marshy meadows.

the living green stuff of which the leaves, and all green parts of the plant, are made.

Leaves can only work when the sun is shining; for the sun gives heat and energy to the green leaf factory. When clouds cover the sun, work slows down, and at night it ceases altogether; the plant then rests.

HOW THE LEAVES WORK HARD TO CAPTURE EVERY RAY OF SUNSHINE.

So all through the long, bright Summer days the green leaves are working away, making the most of every ray of sunshine. Have you ever noticed how leaves spread themselves out so that they do not overshadow their neighbours too much, and so keep them from doing their work? Look at the Ivy, or a Virginia Creeper, growing on a wall and you will see how carefully the leaves arrange themselves so that each one may have its fair share of light and air.

Notice, too, the different shapes of the leaves. Pick a leaf from every tree and plant you see when you are out for a walk in the country, and you will not find two exactly alike. There are large leaves and small leaves; some are round, others oval, heart-shaped, star-shaped, or cut out into all sort of patterns. Some are like broad ribands, others long, narrow and pointed like swords or fine and sharp as needles. Some leaves have smooth edges, others are scalloped, jagged, or cut into fingers or fringes—there really seems no end to all the different kinds of leaves we find growing on the plants in the fields and lanes and woodlands.

Now it is not just by chance that leaves are so different one from another. Every plant has leaves that, by their shape, can best catch the sun's rays.

FRAGRANCE AND COLOUR FILL THE WOODLANDS WITH FAIRY-LIKE LOVELINESS.

In the Summer-time, when everything is growing thick and fast, we shall find all sorts of pretty little plants bravely trying to hold their own on every crowded spot.

The snowy white Stitchwort, sometimes called the "Star of Bethlehem," pushes its slender stems and narrow leaves as far above the tangle of growing things as it can. The pretty little Vetches cling to their neighbours by their delicate tendrils, and so support themselves while they spread out their little leaflets to the best advantage. The Wild Rose and the Blackberry push their way up over the hedge, and through the hedge, with the help of their sharp thorns; while the Honeysuckle climbs just as cleverly by winding its strong, wiry stem round everything in its way.

So in their different ways all plants do their best to get on in the world, and as they work and grow, they make the world a very pleasant place.

There are so many Summer flowers that we hardly know which we like best; sweet-scented flowers like the Rose and the Honeysuckle; tall, stately flowers like the handsome Foxglove; bright, jaunty flowers like the Poppies and the Daisies; or the dear wee flowers like the Scarlet Pimpernel, the blue Forget-me-not and the Speedwell.

We do not find all kinds of flowers growing in the same place. While the Roses and Honeysuckle love the full blaze of the Summer sun, the Foxglove prefers to live in a shady place.

WHY SOME PLANTS HAVE TO GROW AT THE RIVER'S BRINK.

The Forget-me-not is a thirsty plant and is always to be found growing near a stream. The Meadow-sweet, too, loves the water's brink and damp, marshy meadows. Its tall spikes of fluffy, creamy white blossoms give out a strong sweet scent, bringing all sorts of insects fluttering and hovering round it in delight.

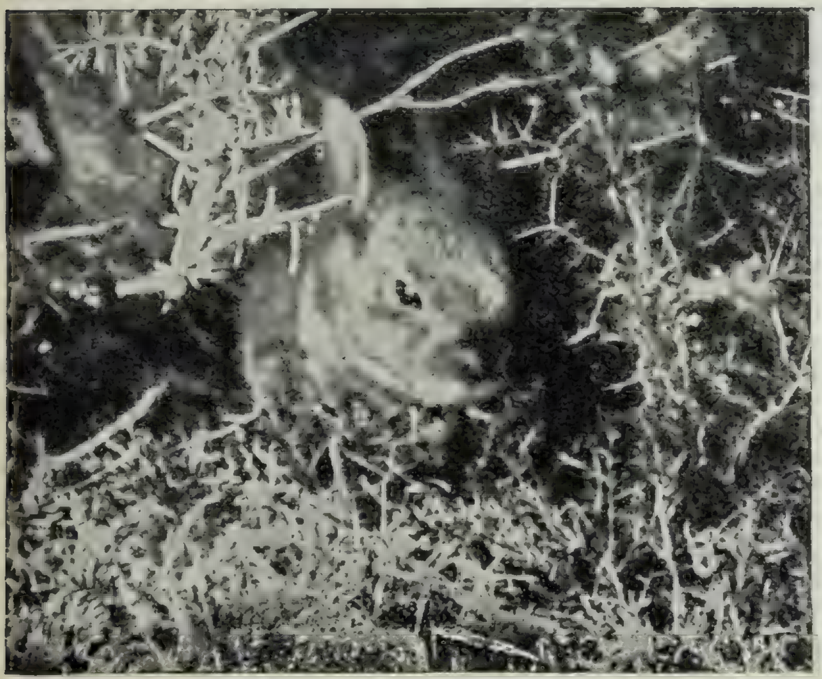
Growing near the Meadow-sweet we are almost sure to find the big Willow-herb, a fine

SILENT INHABITANTS OF WOOD AND FIELD

The Stoat is a fierce little fellow when roused. He preys on rats, mice and hares, and is always ready for a fight. The Hedgehog, on the right, enjoys his leafy supper. He feeds, too, on snakes, worms, snails, and birds' eggs.

The Weasel is an expert tree-climber and also an expert fighter. He has very sharp teeth.

A dainty Chalkhill Blue Butterfly rests for a moment in the sunshine.



Bunny peeps out to see if the coast is clear. He has so many enemies that he has to be always on the alert.

The old Gray Squirrel is very fond of nuts. He is a sensible fellow and stores them up for the winter when the trees are bare.

SOME QUEER OPEN-AIR CREATURES

Jenny Wren, in sprightly mood, has a game of see-saw! On the right, a family of Cormorants are holding a concert together, while above, an Otter creeps stealthily through the woods, trying to escape from his many enemies.

Which would you choose? Two baby Hedgehogs are being held up for your inspection. Their prickles—weapons of defence—are already sprouting and are used to save them from many dangers in their wild, open-air life.

[*Photos: R. McLeod*

bushy plant with pretty pink flowers. "Ragged Robin" is yet another plant that grows in damp meadows, down by the stream, or on the sides of ditches.

The tiny Scarlet Pimpernel does not like damp places at all, and another little plant that likes to live high and dry is the Shining Crane's-bill, which is often found perched up on the top of an old wall or growing over rocks on dry stony ground. The tiny flowers are a pretty rose pink, and the seed-pods are long and narrow, rather like a crane's bill.

HOW THE TINY FLOWERS FORM SOCIETIES TO HELP ONE ANOTHER.

Many of the tiniest flowers form friendly societies to help one another; and dozens, sometimes hundreds, all live as closely packed together as they possibly can. In this way the little things make sure they shall be seen by flies, bees, and butterflies.

A head of clover is not just one single flower, but a number of tiny flowers all bunched up together into a little ball, like the head of a mop.

The golden-eyed Daisy is a cluster of tiny blossoms and not one single flower as you might suppose. So, too, are the bright blue Cornflower and the Dandelion.

Wherever flowers are blooming we are sure to find the little people of the insect world hovering, buzzing, fluttering and crawling about.

Most lovely of all insects are the butterflies. We should miss these bright-winged insects almost as much as the flowers—the dainty white butterflies, the handsome Tortoiseshells, the gay Peacocks, and the dear little Chalkhill Blues, that seem so much a part of the sunny Summer days. Yet sad to say, very few butterflies do any good to the plants; most of them indeed are very harmful, and must be counted among their worst enemies.

THE "SUNSHINE FAIRIES" FLIT FROM FLOWER TO FLOWER, SIPPING THE DEW.

Not that the "sunshine fairies" we see gently opening and shutting their beautiful wings, as they rest on a flower-head, are doing any actual harm at the moment. It is during the first stage of their life, while they are caterpillars, that the damage is done; they then behave much more like mischievous imps than fairies. For though a perfect butterfly or moth takes no food, but just sips a little nectar, or dew, with its long sucking tube, caterpillars are simply ravenous. When there are a great many of them feeding together, they just strip the trees or plants of all their leaves.

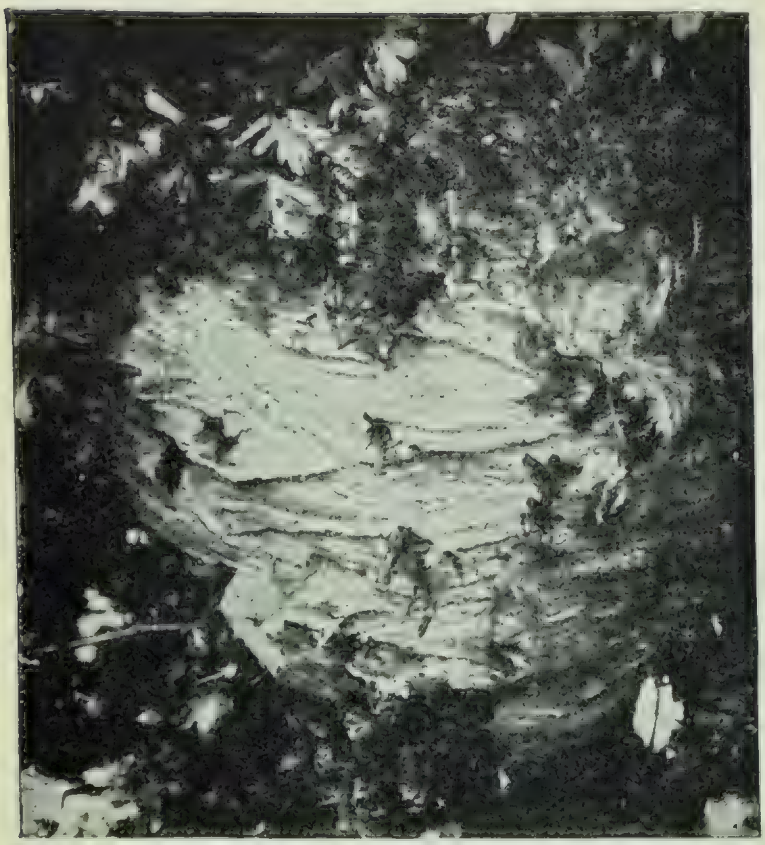
This caterpillar is waiting for the magic change to take place, which will transform it into a beautiful butterfly.

HOW A TINY EGG BECOMES A BEAUTIFUL BUTTERFLY.

The story of the butterfly or moth is as wonderful as a fairy tale. First from a tiny egg comes the baby caterpillar, so small that we can hardly see it without a magnifying glass. It eats and grows, and sheds its skin several times, until at length it is full-grown and can eat no more. Then the caterpillar hangs itself up by its heels, its skin cracks down the back, shrivels up, falls off, and there instead of a caterpillar is a pretty little shell-like thing called a "chrysalis."

Inside this dainty little case the caterpillar goes through a magical change, and when this is complete the chrysalis case splits and out comes a beautiful butterfly. At first its wings are damp and all crumpled up from being so tightly packed inside the case, but as the butterfly rests the wings gradually unfold and dry in the warm air; and away goes the butterfly to spend the rest of its life flitting about as a "fairy of the sunshine."

Although their wings are so delicate and so easily injured, they sometimes carry the butterflies quite long distances through the air.



The Woodwasps make a very cosy nest for their family.

Clouds of white and pale-yellow butterflies are sometimes seen drifting before the wind right out to sea; and one beautiful butterfly, called the "Painted Lady," has often come to us all the way from France.

HOW CAN YOU TELL THE DIFFERENCE BETWEEN A BUTTERFLY AND A MOTH?

Butterflies and moths are so very much alike that it is not always quite easy to tell which is which unless you know something about them. As a rule, moths are duller looking than butterflies, though not always, for some moths are gorgeously coloured; so it is not safe to judge by that. Then, most moths come out at night, when butterflies have gone to bed; yet there are many, chiefly the more brightly-coloured ones, that are to be seen on the wing during the hours of sunshine.

Butterflies as a rule hold their wings upright above their backs when at rest, while moths either keep them spread out or folded over their backs like a cloak; yet many butterflies are fond of spreading out their wings or gently fanning them as they rest on a flower in the sunshine.

Yet there is one way in which you may always know a moth from a butterfly. Look at their *antennæ*, as their long feelers are called. If they are straight and have knobs, or are thickened at their tips, the insect is a butterfly; but if the feelers are feathery, or like fine threads with pointed ends, you may be quite sure that they belong to a moth.

Although most flowers close at night, there are a few that keep wide open and give out their sweetest scents on warm summer evenings, so the night-flying moths take the place of the bees and butterflies and play the part of pollen carriers to these evening flowers.

HOW THE BEES WORK DAY AND NIGHT TO MAKE HONEY.

Although moths and butterflies, flies and beetles, are all servants of the plants, very few of the insects can be trusted to do their work well. As likely as not, after buzzing about a Wild Rose a fly will whisk over the hedge and pop down on a field Daisy, to whom the pollen it carries is quite useless. Only the bees can always be depended on. If a bee starts gathering honey from Clover, it will visit only Clover blossoms.

Summer is a busy time for the bees. Numbers of bees are making the cells into which the outdoor workers pour the honey whenever they bring it home; other workers seal up the cells with lids of wax. Some of the bees act as nurses, looking after and feeding the baby bees as they lie in their waxen cradles.

Baby bees are strange little creatures; they have no legs, wings, or anything that can be called a head. They are just like tiny white bolsters. Then gradually the baby bee changes

The Nightingale—sweetest singer of the woods, whose notes are heard at night.

from a fat little grub to a perfect winged bee, and takes its place among the other workers.

Wild Honey Bees live and work in just the same way as the Hive Bees, making their home in a hollow tree or any large empty space they can find to suit them.

The big velvety Bumble Bees live in nests in holes in the ground, or hidden under a pile of moss and dead leaves. They store no food for the cold winter months that are coming, so when autumn draws to a close, nearly all the easy-going Bumble Bees die. Only a few young Queens manage to live through the winter, and they will come forth again in the spring to start new Bumble Bees' nests.

THE SWEET SINGERS OF THE WOODS WARBLE THEIR DITTIES.

Birds are shy, nervous little beings, always on the alert for danger. They are more often heard than seen ; so it is by their song that we may more easily learn to know which is which.

The Nightingale, of course, is the most famous singer of all. But there are many other sweet singers besides the Nightingale.

The Blackcap trills away so sweetly that he is sometimes mistaken for the Nightingale. The Garden Warbler has a low, sweet warbling song, while the Willow Wren sings away from morning to night so delightfully that he is sometimes called the " Canary of the Woods."

The Hedge-Sparrow has a sweet, cheery little song, something like a Robin's, though not nearly so loud. This little brown bird stays with us all the year round and is not just a summer visitor like the Nightingale, Blackcap, Whitethroat, Chiffchaff, and Willow Wren.

The lazy Cuckoo never troubles to build a nest of its own.

An Elephant Hawk Moth finds something interesting in this beautiful bunch of Honeysuckle. [*Flatters & Garnett*

The best way to see our little feathered friends is to find a pond or quiet stream on the outskirts of a wood, then sit down quietly to wait and watch. Sooner or later all the birds living round about will come down to the water to drink and bathe.

Blackbird and Thrush you will recognise at once, as well as the jaunty Chaffinch, the Blue Tit, the Great Tit, and the Long-tailed Tit ; while that quiet-looking bird, rather bigger than a Robin, with a reddish-brown coat and a gray waistcoat is the Nightingale.

SOME FEATHERED FISHERS SEARCH IN THE STREAM FOR FOOD.

The Chiffchaff and the Willow Wren are very much alike. Both are small greenish-brown birds with light waistcoats, but the Chiffchaff is the brighter of the two and his waistcoat has a more yellow tinge.

We must remember that as a rule the cock is more gaily dressed than his little mate, and the younger birds more brightly plumaged than the older ones, if we wish to know all our little feathered friends by sight.

Running about by the side of the water we are almost sure to see a Wagtail, or rather *two* Wagtails, as these amusing little black-and-white birds always go about in pairs. You will recognise them by the funny way they have of wagging their long tails up and down all the time whatever they happen to be doing. This is why they are called Wagtails.

Down by a quiet stream, if we are lucky, we may see the Kingfisher, the brightest of all our English birds, dart past like a flash of bright blue, flying low over the water. Sad to say, this beautiful bird is becoming rarer every year, as thoughtless people so often shoot it for the sake of its lovely blue feathers. But these pretty feathers lose their lustre when the poor bird is dead, and do not look at all the same as when they flash and glitter in the sunlight as the little Kingfisher skims over the stream.

HOW THE CLEVER LITTLE WATER-BIRDS DIVE IN SEARCH OF PREY.

When the Kingfisher has flown off down the stream we may perhaps see a shy little Moorhen swimming in and out of the tall reeds and rushes with a string of tiny Moorchicks paddling along behind her.

The Moorhen is a quiet, neat little bird, dressed in a dark feathery suit, with a few white feathers in her wings and tail, and a bright red patch like a shield upon her forehead. Her floating nest is made of the long dried leaves of yellow water-flags and flowering rushes, and looks like a big flat rush-basket.

The Coots are very like Moorhens, but they are larger birds and have a white shield on their forehead instead of a red one.

The Little Grebe, or Dabchick, as it is often called, is another water-bird seen on quiet streams and slowly-moving rivers. It is a smart little bird with smoky brown feathers and a rusty red throat and breast, and is a most wonderful trick diver.

"When will dinner be ready?" asks this family of hungry Sparrows, and mouths open wide in anticipation.

The Wryneck lays its eggs in a hole in the tree.

TAP, tap, tap! Who is the little "woodman" who is hammering away so briskly?

If we follow the sound, we may perhaps catch a glimpse of a Green Woodpecker, clinging to the trunk of an old tree. He is not simply amusing himself; he is working for his dinner. With his strong bill he is ripping out the fat grubs of the wood-boring beetles that lie just under the bark, or in tunnels and galleries which they gnaw out in old decaying trees.

The Green Woodpecker is a handsome bird dressed in green and yellow, with a white throat and a cap of crimson feathers. He is a famous climber as well as a skilled carpenter, and has a joyous laughing cry, as if he thought the world a very merry place in the happy summer days.

HOW THE CARPENTER OF THE WOODS BUILDS HIS NEST.

In the woods in the warmer parts of England are the Great Spotted Woodpecker and the Small Spotted Woodpecker. Both birds are good climbers and carpenters, but they do not laugh like their cousin in green. The Wryneck, another little woodland dweller more often heard than seen, has gained its name from the queer way it has of twisting its funny long neck about.

Like the Woodpecker the Wryneck lays its eggs in a hole in a tree, on a little heap of wood chips to serve as a bed for the baby birds.

"What a strange world!" says the baby Sedge Warbler; but presently you will hear him singing sweetly among the reeds. By the riverside or near the lake.

The Wood Pigeon is one of the gentlest and most lovable of the woodland dwellers. It is also called the "Ring Dove," because of the ring of white feathers it wears like a collar round its neck. All through the summer you may hear its soothing note as it sits high up among the leafy boughs.

Very different is the loud harsh scream of the Jay. The Jay's voice is certainly not sweet, but he is a clever bird and a handsome fellow, too, dressed in soft brown, with black, yellow, and blue feathers in his wings, a crest of feathers on his head, a white throat, and a fine black feathery moustache.

HOW THE SKYLARK WEAVES A WARM NEST NEAR THE GROUND.

Not all birds care to live in woods and sheltered lanes. The Skylark is a bird of the fields and meadows. It makes its nest in tussocks of long grass, growing corn, or sometimes even among clods of earth in a ploughed field.

The nest is made entirely of dried grass, neatly woven into the form of a cup or bowl; and, with the hay growing up all round it, is not at all easy to find, as the nest and the grasses are so much the same in colour. The baby birds, too, are so like little lumps of earth in their mottled brown feathers you might walk right over the tiny things and never notice they were there, unless they moved. Young birds whose nests are on the ground are nearly always protected in this way. They are so like stones or clods of earth that they often escape the sharp eyes of hungry birds of prey and other wild creatures who are hunting for food; and the baby birds soon learn to crouch down and keep perfectly still at the first sign of danger when their parents are not at home.

SOME GAY LITTLE BIRDS THAT FLUTTER ABOUT IN THE AIR.

While the little hen bird is sitting closely on her eggs, or brooding the newly hatched baby birds under her wings, her little mate sings to her his most delightful songs as he mounts up into the sky far above her head.

The Meadow Pipit, or "Titlark," is another bird that sings while he is in the air. The Titlark is very much like the Skylark in his soft, spotted brown coat, but he is a smaller bird, and although he has a sweet little song, it is not so loud and thrilling as the song of a true Skylark. The Tree Pipit is even more like the Skylark, as it is larger than its little cousin (the Meadow Pipit) and has just the same coloured feathers.

Two dear little birds we are sure to see and hear on the common, where golden gorse and heather grow, are the Whinchat and the Stonechat, tiny things, not much bigger than a Blue Tit. Both have, as a rule, two broods in the year, and the Stonechat may still be feeding a nest of youngsters as late as in July.

The Yellow-hammer, another bird that lives out on the commons and in open fields, is a

The Bullfinch hates the cold blasts of winter, when food is scarce, and is always glad of a free breakfast of crumbs.

A herd of Deer meet together at Windsor Park. They are evidently on the alert for some intruder. [*W. F. Taylor*

larger bird than the two little Chats, and has a brown coat and a yellow head and breast.

Most of the wild creatures are shy and cautious. They usually stay at home during the daytime. Only in the evening do they come out, when few people are about.

But our friend, Red Squirrel, is lively enough. He goes to bed at the proper time, when the sun has set, and is frisking and leaping about from dawn till twilight.

THE BUSHY-TAILED SQUIRREL IS A CLEVER CLIMBER.

Each pair of Squirrels has its own comfortable home to live in, high up in the branches of a tree; and nearly every pair has now a little family of three or four furry babies to take care of.

As soon as they are able to leave the nest, and climb about in the trees, what games the little Squirrels have! Then when night comes, tired out with play the little Squirrels curl up in their nursery with their tails coiled over their noses, and are rocked to sleep as the breeze gently sways the boughs of the tree.

The Song-Thrush, or Mavis, is one of the sweetest musicians of the woods. It stays with us all the year round and builds a very deep, cup-shaped nest. *W. F. Taylor*

When the Squirrels are thinking of going to bed, many other wild creatures are just waking up. The Hedgehog, who has been fast asleep all day, unrolls himself and comes out for a walk in the twilight. He spends the warm summer nights hunting for food. The Hedgehog is not very particular about what he eats; he will grub up roots out of the ground, eat berries, young frogs and mice, suck eggs from their shells when he can find any, or make a meal of a small snake.

Sometimes on late summer evenings one may see the whole Hedgehog family, father, mother, and little ones, all snuffing and rooting about together in search of their evening meal.

The Hedgehog is a harmless, useful creature, and if you can persuade one to live in your garden, he will work away at night and destroy slugs and snails, and other tiresome creatures.

HER LARGE, FRISKY FAMILY KEEPS MOTHER RABBIT BUSY.

Like the old woman in the shoe, Rabbits have so many children that they do not know what to do; by mid-summer many parts of the countryside are overrun with them.

The young Rabbits have a happy time. They nibble the fresh green grass, keeping the turf on the common so short that it is delightful to walk on. They also munch the tender young gorse shoots, that, if they were not kept down, would grow up into quite a forest of prickly furze; in this way the Rabbits do some good. But they are not content to keep within bounds on the heaths and commons. At night they go into the fields and feast away until morning on growing corn and green crops of all kinds, and that is quite another story.

A rest between races! Three young lambs take a breather after a strenuous time playing in the fields.

Baby Bunnies are so full of life and spirits that they are popping in and out of the warren all day, chasing each other, or playing hide-and-seek round the bushes near their home.

Some of the older Rabbits appear to act as sentinels and keep watch while the others are carelessly enjoying themselves, for they have many enemies to fear.

One of their worst foes is the Fox. At night when the Rabbits are feeding Master Reynard also comes out for his supper, and many a poor Bunny is seized and carried off to his den.

The Fox is a smart-looking animal, with his sleek red coat and white waistcoat. He is very much like a dog, though his legs are rather short for his size, and he has a remarkably big bushy tail, which is always called his "brush." During the day he generally stays at home in his "Earth," a good-sized dug-out at the end of a long, underground passage that winds its way among the roots of old trees or between rocks and stones.

The Fox and his mate, who is called a "Vixen," live together in the Earth with their little ones. There are, as a rule, four or five cubs, who in the summer-time are old enough to come up out of the burrow and play about round the entrance to their home.

Sometimes the Fox brings home a Partridge, sometimes he will raid a poultry-yard or pounce on a young Bunny to provide a dinner for the excited little cubs.

BEASTS OF PREY. SOME SLY CREATURES OF THE WILDS.

Although the Fox is now the largest beast of prey in England, the little wild creatures have even more to fear from two small, blood-thirsty animals that are found all over the countryside.

These are the Stoat and the Weasel. Both animals have long, snaky bodies, long necks, sharp little heads with pointed snouts, very short legs, and funny little stumpy tails, but the Stoat is twice the size of the Weasel, and has a brown coat and a pale yellowish waistcoat; while the Weasel's coat is almost red, and its throat and breast are pure white.

THE BLOOD-THIRSTY ANIMAL WHICH WILL FIGHT WITH ANY CREATURE.

The Stoat, the larger animal of the two, is also called the Ermine. It lives in a burrow in the earth, tunnelled out in a dry bank, where the door into its home is well hidden. Stoats usually hunt in couples. If you see one you may be sure there is another not very far away. The Stoat will attack an animal ever so much bigger than itself, and however fleet of foot it may be will run it down in the end.

The Weasel is every bit as fierce and bold and cunning as its cousin, the Stoat, but as it is so much smaller it preys chiefly on mice and rats, moles and small birds.

Baby Weasels are the most playful of all

The Chiff-chaff hops off to show her nest.

young things. It is the funniest sight to see them on a summer evening frolicking about near the entrance to their home. They skip and bound and tumble, have mock fights together, and clasping each other with their tiny forepaws, roll over and over on the ground so fast that it almost makes you giddy to watch them.

A bevy of Blue-Tits holding a concert.

Weasels sometimes hunt in packs. Five or six fierce little hunters, probably all belonging to one family, are often to be seen leaping and bounding along together on the track of some unfortunate animal, and nothing will stop them until they run poor Bunny to earth.

The Badger is about the same size as the Fox, but in shape he is much more like a little bear. He has a round bulky body, covered with a thick, shaggy coat of grizzly gray hair. The Badger is very rare now in England.

He lives in the deepest, thickest woods, on the side of a cliff or a disused quarry, his home a large roomy hole in the earth at the end of a long winding passage.

He is a lazy old fellow, not very particular about his food; he goes snuffing about and snaps up anything eatable that comes in his way.

Though naturally a quiet, harmless animal, he is very strong, and if attacked will fight fiercely with teeth and claws.

The Otter, another member of the Weasel tribe, is a sharp, active animal. He is almost as big as the Badger, but his habits are different.

He has a slim body, rather a long muzzle, and very long whiskers. His tail is long and broad and flat, while his legs are short. His feet have webs between the toes, which, of course, tells us that he is a water animal. Although he spends some part of his time on land, he is much more at home in the water. There he swims and dives, twists and turns as easily as a fish. On shore he is not so nimble.

Although he is rather a fierce little animal, the Otter is shy. In the winter when ponds and streams are frozen over, he is obliged to hunt inland, and will sometimes raid a poultry yard and kill fowls and ducks, but fishing is his chief delight. In Scotland, where Otters are more plentiful than they are in England, these animals often do a great deal of harm by killing large numbers of salmon.

A family of Swans enjoy themselves by the water-side. The young Swans, or "Cygnets," seem to prefer the water.

MELLOW AUTUMN WHEN LABOUR IS REWARDED

SUMMER has gone. But the sun still shines warmly in these early autumn days. The Hazel nuts in their little green frills are beginning to turn brown, and in the fields the ripe wheat has all been cut down. Everywhere the children of the plants are getting ready to leave their nurseries and start out into the wide world.

The last thing that the plants do for their children is to give them a good send off ; and they take pains to send them as far away as possible. Most plants, you know, have very large families, and if they were allowed to spring up all round the parent plants there would be no room for them all to grow strong and healthy.

Out on the common on a sunny autumn day we may hear mysterious little pops and cracks going on all round us. It is the prickly Gorse and the yellow Broom saying "good-bye," as they send their children off into the world. The noise is made by the bursting of the dried seed-pods, which suddenly explode in the hot sun with a sharp report and shoot the seeds out in all directions.

In autumn the golden sheaves fall before the reaper, and the ripe corn is safely gathered. Rich tints sparkle on the trees and hedgerows, and Nature is now at her fullest.

HOW THE "CLOCK" OF THE DANDELION SETS OUT ON A JOURNEY.

The Dandelion, the Thistle, and the Wild Clematis have an even better plan for sending their large numbers of children abroad. Instead of being shot out like peas from a popgun, these plant babies are provided with dainty feathery parachutes with which they float away on the wind, sometimes ever so far, to seek their fortunes.

The "clock" of the Dandelion is a mass of little feathery seeds, all clinging together as they wait to start out on their journey. Then comes a sudden puff of wind and away they all go sailing lightly through the air. Each little seed is firmly attached by a slender stalk to a dainty parachute, like a tiny umbrella turned inside out, which will carry it safely away for miles.

CLOUDS OF THISTLEDOWN WHIRL THROUGH THE AIR, CARRYING SEEDS WITH THEM.

Clouds of Thistledown, light as air, are wafted away in the same manner, and if the wind is strong and steady, a few of the seeds may even be blown right over to France. There, if they come down on a suitable spot, they may in time grow into tall, stately plants, though I do not suppose that any one would guess they were really British Thistles.

Towards the end of September the pretty, feathery seeds of the Wild Clematis, or "Old-Man's-Beard," as it is often called, hang down in curly, tangled masses, all silvery gray, almost smothering the hedgerows in the lanes. As the autumn winds come bustling by, great handfuls of the feathery stuff (enough to make a fine beard for Father Christmas) are torn off and whirled away ; so, as the days go by, the "Old-Man's-Beard" begins to look rather ragged.

The feathery seeds go whirling and dancing down the lanes and over the fields. Some are caught and held fast by the thorns and brambles, others sail away over the hedges and tree-tops, and when the wind drops fall lightly and gently to earth.

A great many of the plant babies that are blown out into the world in this way fall into streams and ponds, others come down on hard ground where they cannot take root, but those which are lucky enough to alight on a suitable spot, will, after their winter's rest, spring up as new plants. This is why plants need so many children, for of all the hundreds of seeds that start off in the autumn on their voyage of adventure, only a few ever grow up.

Instead of feathery parachutes, many of the woodland trees provide their children with wings, or aeroplanes, with which they fly away to new ground. Such are the "keys" which cluster on the ash and maple. When the keys

The " clock " of the Dandelion is a mass of tiny feathery seeds which a puff of wind can carry on a journey.

become detached from the branches they are caught by the wind and set spinning like tops in the air, to come down to earth at last quite a long way off.

Not all plants trust their children to the rough ways of the wind, that scatters the seeds far and wide just as recklessly as it scattered the golden pollen from the catkins in the spring-time.

Just as the flowers displayed their pretty petals and kept stores of honey to tempt the insects to carry their pollen, so, now, plant babies are surrounded with sweet, juicy pulp and covered by brightly coloured skins to attract the birds and induce them to carry the seeds away. The hedges are covered with Blackberries, scarlet Hips and Haws, and the soft shining red berries of the Honeysuckle and Bryony.

Other plants trust neither the winds nor the birds.

Poisonous Toadstools, which we have to be careful not to mistake for Mushrooms, infest the woods. Never eat one of these or even handle it.

When the chestnuts grow loose and tumble out of their prickly cradles, they have such slippery coats that most of them are sure to roll some distance from the tree before they sink into the ground.

The prickly little burr that clings so tightly to our clothes is another device that certain plants have for sending away their children.

Grazing sheep and cattle, and dogs when hunting rats and rabbits, often get these tiresome little burrs entangled in their hair or woolly coats. To get rid of the worrying, prickly things the animals, as they wander about, rub themselves against trees and posts and bushes, until they rub them off. Thus are the seeds carried away to fall on fresh ground.

THE FUNNY LITTLE PLANT CALLED "JACK-IN-THE-HEDGE."

That curious plant called " Jack-in-the-Hedge," or " Goose-grass," that winds its long sticky stems in and out the hedgerows, acts in this way ; and so does the Hounds-tongue, a wayside plant with small purple flowers, and such a disagreeable smell that most animals, and even insects, give it a wide berth. So the seeds would stand a poor chance of being carried away if it were not for their prickly coats.

Water is another and often a very hard-worked carrier. The seeds and fruits of Water-lilies have spongy coverings filled with air, thus enabling them to float about until they become water-logged and sink. Sometimes they gently sail to the water's edge, where—

embedded in a little clodlet—they are picked up on the feet of birds. Charles Darwin, the famous scientist of last century, once reared eighty-two seeds from one single ball of earth accumulated on a partridge's foot !

We now see the wonderful way in which the wind, the insects, the birds and the beasts all play their part in helping the plants to disperse their children. All Nature's creatures work together and help one another.

WHY HAVE WE TO BE CAREFUL WHEN PICKING MUSHROOMS ?

In the woods we shall find, low on the ground, little groups of " Toadstools," dotted here and there at the foot of the tall trees.

The plants on which these toadstools grow prefer to hide away from the sun, and love best to grow in damp, dark places. They have neither flowers nor leaves, but are just bundles of hollow, branching threads that twist and twine, and push their way in all directions under the surface of the soil or the masses of decaying leaves that lie beneath the trees in the woods. The toadstools that hold up their many-coloured heads, orange and crimson, pink, purple, white, above the dark ground, are the fruits of these queer plants or " Fungi."

Now as these fungi have no leaves they cannot get their food supplies from the sunlit air as all green plants do ; yet to live they must eat, so they help themselves to the stores of nourishing things manufactured by the hard-working plants.

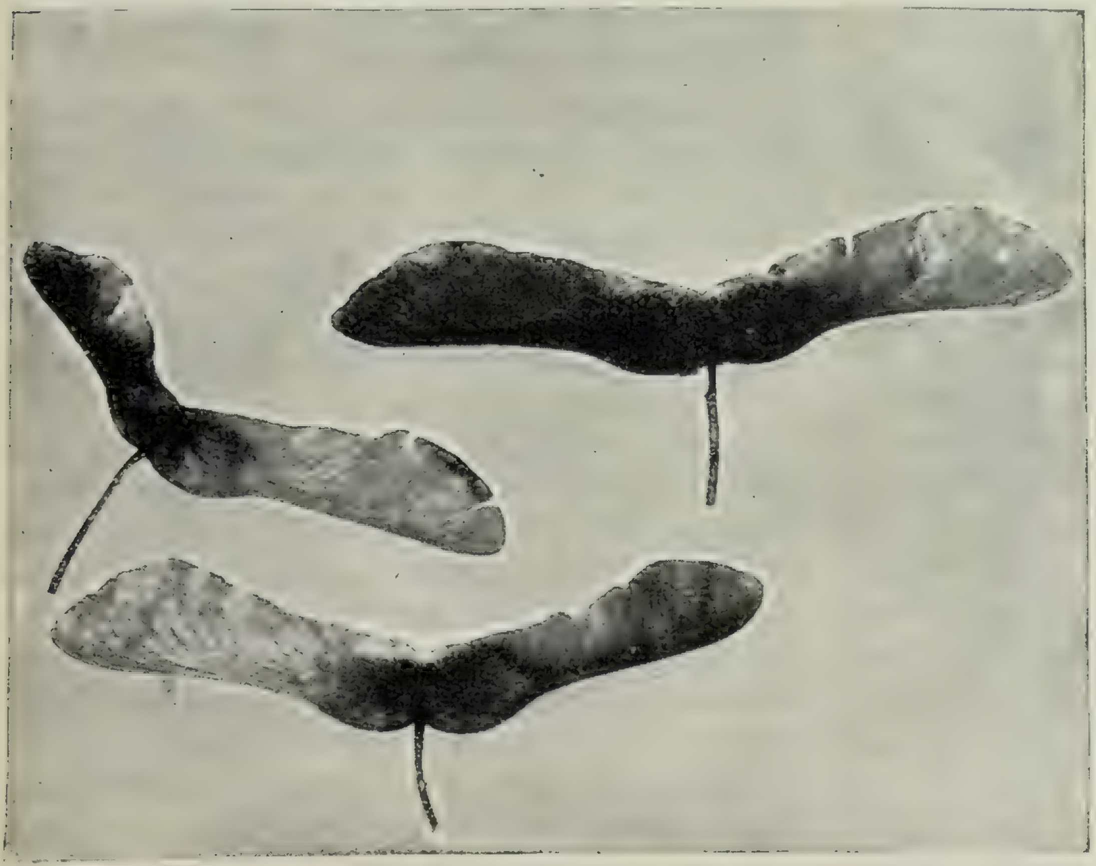
Dainty, feather-weight Thistledown swaying in the breeze.

The bright toadstools in the wood only draw their nourishment from dead leaves and rotting wood, but there are other members of the Fungus family that fasten themselves to green plants and rob them of their food, often draining away their very life.

As the fungus has no flowers it can have no seeds. Under its cap, however, on the leaves, or " gills," are quantities of tiny, flat *spores*. When the toadstool ripens and shrivels up, these spores are set free, and every spore that settles in the soil or in some crack or crevice puts forth fine delicate threads and grows into a new fungus plant.

There are a great many different kinds of fungi. Many, like the Mushroom, are good to eat, but others are very poisonous ; and as it is difficult to tell the good kinds from the bad, it is wiser never to eat a toadstool.

One very curious fungus is called the " Puffball." If left undisturbed in some sheltered corner, it will often grow as big as a football.



Some seeds are provided with wings. Those curious " keys " cling in clusters to the Maple tree.

The Puffball has no gills, its spores are inside the ball, which is simply a leathery sack, at first white, but changing to pale brown as it grows larger. When it is ripe the ball bursts, and a large powdery mass of spores escapes and is blown away like a cloud of dust. We may see numbers of these strange Puffballs of all sizes dotted about in the fields and on the hillsides.

WHERE DO BUTTERFLIES LIVE IN THE COLD WINTER WEATHER ?

The careless Grasshopper and thousands of other tiny creatures who have made no preparation for hard times are killed by the first hard frost; but Dame Nature does not allow all her thoughtless children to perish. She has ways and means of protecting even the weakest of insects and sheltering them, or their children, until the return of spring.

So soon as cold weather sets in the late butterflies creep into sheds or barns, or under the thatched roofs of cottages and hay stacks, to sleep the long, dark months away.

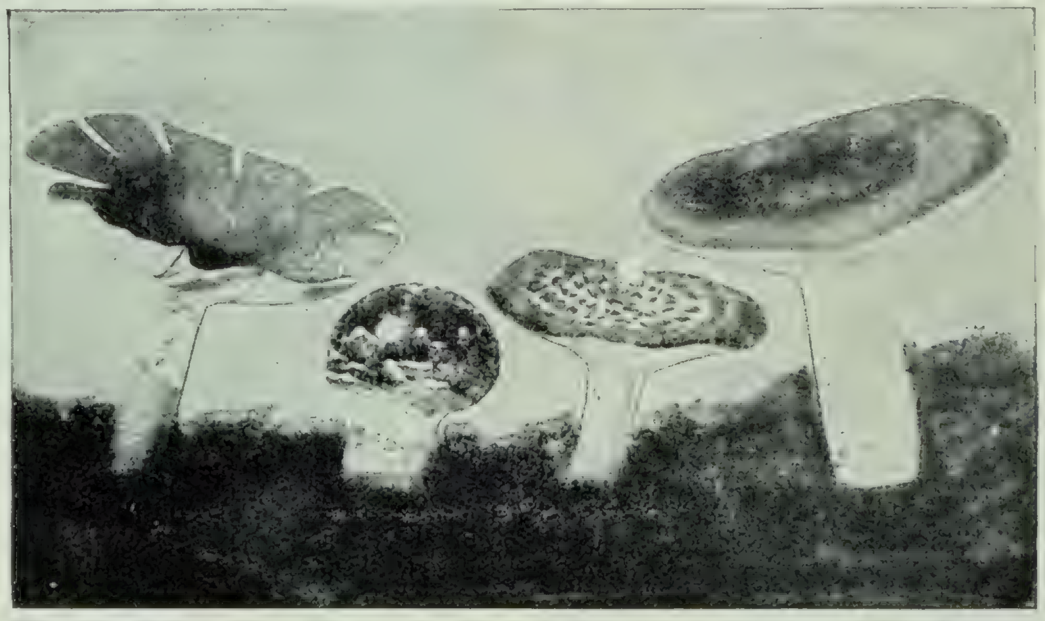
Big, full-grown caterpillars hang themselves up by their tails in some crack or crevice and turn to chrysalides ; while younger caterpillars, too small yet to change to chrysalides, tuck themselves away in cracks in the bark of trees, or creep underneath leaves that have not fallen from the branches. The baby caterpillars of the Purple Emperor, a handsome butterfly that loves the oak woods, wrap themselves up in little bundles of dead oak leaves and just go to sleep until spring comes around again ; while the children of the White Admiral, another woodland butterfly with white bands on its wings, make themselves little hammocks with honeysuckle leaves, which they fasten firmly to twigs with silken threads from their tiny mouths.

THE BUSY LITTLE INSECTS WHO BELIEVE IN THE SCOUT MOTTO "BE PREPARED."

The caterpillars of many moths weave silken cocoons before they change to chrysalides (or " pupæ " as they are rightly called), and in these snug little cradles they rest through the winter. Yet, in spite of all the precautions, if we have a long, hard winter, very few of the little creatures will awaken to life again in the spring.

Now the bees and the ants (wise insects), leave nothing to chance. They have adopted the Scouts' motto, " Be Prepared." In the hive the combs are full of honey, and every little crack in the walls is carefully filled up to keep out the cold. All work now ceases. The " lazy drones " are wounded and driven out-of-doors.

Honey is rationed, and no bee attempts to eat more than its fair share. So now the wise little hive bees settle down for the winter.



These are toadstools. Don't forget that toadstools are poisonous! Mushrooms never grow like this, with "umbrellas" inverted.

Ants are quite as clever and industrious as bees. They make the most wonderful dwellings under the ground, with a hillock to act as a roof. The big black wood ants may build regular " ant-mountains," two or three feet high and ever so many round, and there may be thousands and thousands of tiny ant-people living together in one of these large ant-hills.

PARENTS WHO LEAVE THEIR CHILDREN TO GO OFF ALONE ON THEIR FIRST ADVENTURE.

All through the spring, summer, and autumn they work away with a right good will. Some go off to hunt for food, some to fetch building materials, while others stay at home to do the housework, look after the children, and attend to the queen ants. Now they have a strong, warm house, and everything they need until spring comes again.

Every day the Swallows and Martins are getting ready for their long journey across the sea. The old birds are a little bit anxious and fussy, but the young Swallows and Martins know no fear. Their wings are so strong, their feathers so glossy, and their eyes so bright, they look and feel fit for their long flight over land and sea to the sunny shores of Africa.

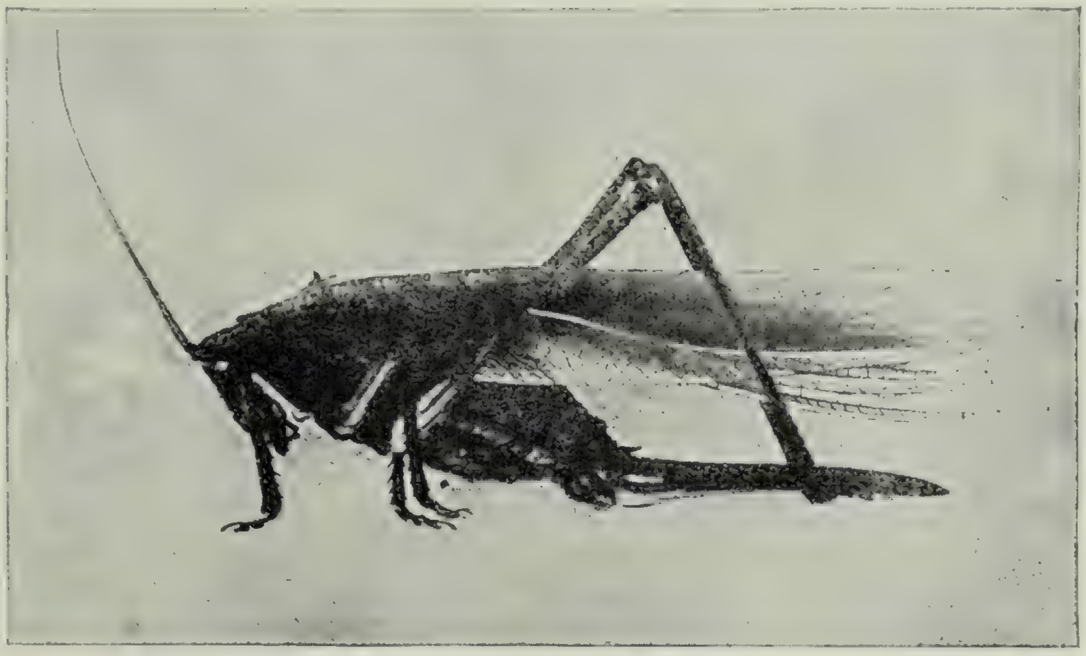
Strange to say, the parent birds do not accompany their children on their first great adventure. The young birds go first, and in some wonderful way that we cannot understand

—by instinct, as we say—find their way safely to a country they have never seen, a thousand miles or more away from the nest under the eaves in which they were born.

HOW THE BIRDS GO OFF IN SEARCH OF THE SUNSHINE.

As the day for leaving draws near, all the young Swallows in the neighbourhood gather together—waiting for the signal to start upon their journey. Then, suddenly, they are gone! A few more days and the elder birds, too, have slipped away to follow the young ones over the sea.

Why do the Swallows and Martins leave us? They go because food is getting scarce and the nights are growing cold. For, although they are strong enough to fly so far, Swallows and Martins cannot stand very cold weather.



The sprightly Grasshopper, that hums such a cheery song, is seldom at rest.

Swallows and Martins are by no means the only birds that fly away to foreign lands when summer has gone. The Nightingales, the Warblers, and the Whinchats all hasten away, one after another, as soon as autumn sets in and food grows scarce in the land.

WHAT BIRD WAS FIRST BROUGHT TO ENGLAND BY THE ROMANS?

Many of the birds travel in flocks; others slip away quietly, in small parties or in pairs; but all fly south, to distant lands where the sun shines almost all the year round and where they are sure of finding plenty to eat.

When the year's work is finished, when the young birds have left the nest and there is nothing more to do at home, birds grow more friendly towards each other. Numbers of Finches, Sparrows, Linnets, and Starlings gather in flocks and fly about the country in search of food.

In the wood the soft " Koo-roo, Koo-roo " of the Ring-dove gives place to the loud " Kok, kok, kok," of the cock Pheasant, a handsome bird whose feathers gleam with green and purple like shot silk, while his fine long tail feathers sweep the ground like a train. He can boast, too, that he comes of a very old and distinguished family; for the Pheasant was first brought into England by the Romans —at least nineteen hundred years ago. He is treated with great respect, but alas, only that when autumn comes he may be shot by sportsmen. At other times he is protected by law.

Quite unlike the lordly Pheasant is the plump, homely, little Partridge, another game bird that is to be seen in the autumn running about in the stubble fields or feeding among the turnips.

In October, when the ground is being ploughed, Rooks and Starlings flock to the fields to gobble up the worms and grubs that are turned up in hundreds by the plough, while Lapwings, Jackdaws and big white Gulls fly from far and near to join in the feast.

Although Crows and Rooks are much alike in appearance they are not alike in their ways. Crows go about alone, or in pairs, while Rooks like to live together in a neighbourly way. They build their nests side by side in "Rookeries" up in tall elm-trees, and there they chatter and caw from morning to night. Large parties of Jackdaws, too, live together, generally in holes in the sides of a cliff or quarry.

The handsome Lapwings, or " Peewits," are easily distinguished by the long feathers on the top of their heads which sometimes stand upright like a crest.

THE LITTLE THIEVES WHO ARE ENEMIES OF THE FARMER.

Although they are such pretty little things, and most interesting in their ways, the farmer does not like Field Mice at all; and when we consider all the damage they do to his crops, this is not to be wondered at. Besides carrying off all the seeds and grain they can collect to their underground towns and villages, they will invade the barns, and swarm all over the cornstacks and hayricks.

The Long-tailed Mouse is a shy, pretty little creature with a sleek ruddy-brown coat and a white waistcoat with a pale brown patch right in the middle of his chest. He is very quick and nimble, and can leap and bound like a tiny Kangaroo.

HOW CAREFUL LITTLE MICE PREPARE FOR THE WINTER.

The Short-tailed Meadow Mouse is not nearly so brisk and bright as his long-tailed cousin. He is dressed in gray and has such a dull, frightened air. Yet, to the farmers, he is every bit as troublesome as the Long-tailed Mouse.

Nowhere shall we find a more charming little animal than the Harvest Mouse, with its soft furry coat, shading from yellow to orange, his snowy waistcoat, tiny ears, bright beady eyes, and his dainty little ways. He is the smallest of all the Field Mice, and weighs less than a quarter of an ounce.

Unlike most mice the Harvest Mouse does not live in a burrow, except sometimes in the winter-time.

He is a wonderfully quick and active little animal. He can run straight up a tall corn-stalk and stand bolt upright on the top of a swaying wheat-ear.

Mother Harvest Mouse makes the most beautiful little nest of the leaves of the corn, and in it the baby Harvest Mice sway gently to and fro amidst the ripening grain.

One would hardly believe it possible to find a four-footed animal smaller than the Harvest Mouse; yet the Pygmy Shrew Mouse is actually smaller still. Although this tiny creature is called a " mouse " it is not really a mouse at all, but is more nearly related to the Mole.

As they are insect feeders, the Shrews cannot lay up a store of food for the winter, but they stay at home in their burrows, sleeping away most of the cold days.

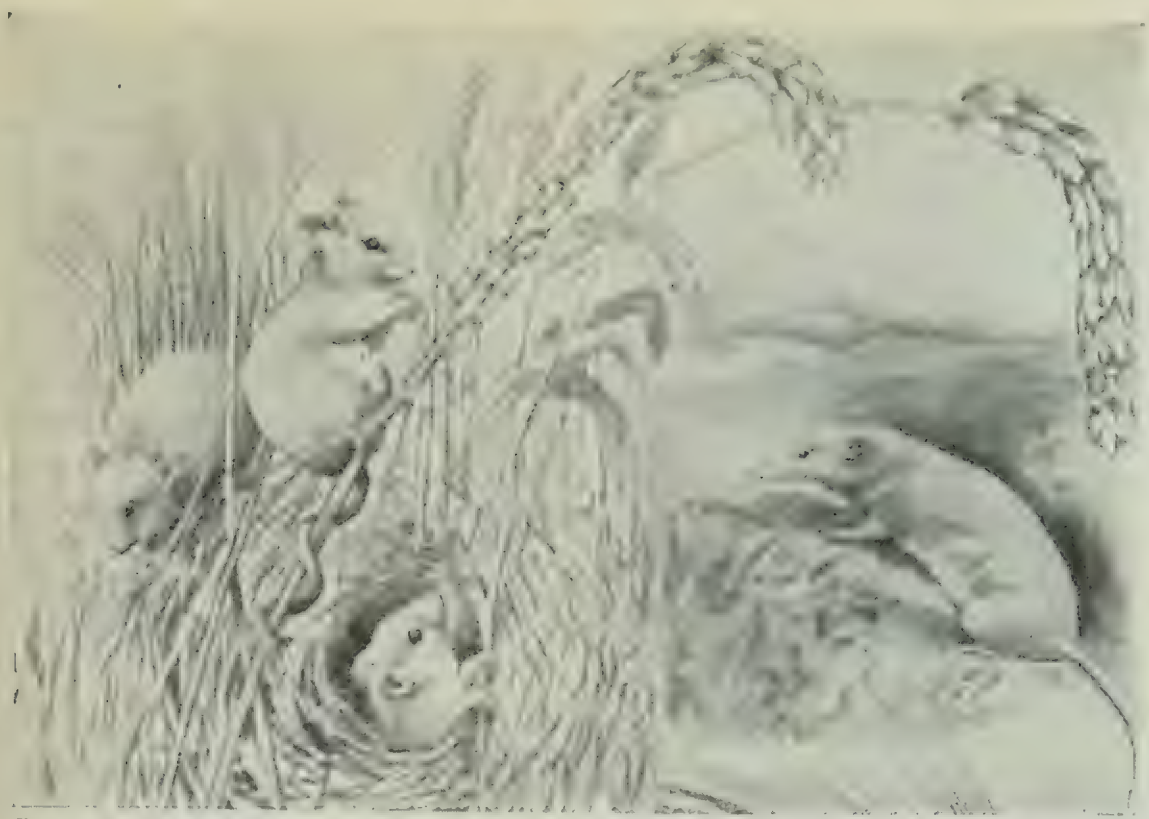
Just as amusing in their ways are the Water Shrews, that live in burrows in the banks by the side of slow-moving streams. They are the largest of the British Shrew Mice, have thick black fur coats and white waistcoats, and are capital swimmers.

THE SNUB-NOSED WATER RAT IS A HARMLESS LITTLE CREATURE.

Another interesting animal that we may chance to see, if we wait and watch quietly by the side of a gentle stream, is the Water Rat.

The Water Rat is as big as the common Brown Rat, and very much the same colour, but there the resemblance between the two animals ends. The Water Rat is plump, and his coat is rather rough looking, except when it is wet. Then his tail is long and covered with thick hair ; and he has a snub nose, bright beady eyes, and small ears almost hidden in his long fur.

Coming for a swim ? The rough-coated Water Rat lives on the river bank, where it finds its food.



Gay little Field Mice search for food in the harvest field. They climb up the corn, twisting their tails round the stalks. On the right is a tiny Shrew Mouse.

The Water Rat makes his home in the banks of the streams, eats seeds and roots, and gnaws the bark of young trees, but what he likes better than anything else is the soft pith in the stems of the tall water-reeds.

Sometimes the farmers and gamekeepers wage war upon the Water Rat, but really he is a harmless little creature and very useful in keeping down the growth of water weeds that choke up the ponds and streams.

Our sleepy little friend the Dormouse, who did not leave his cosy bed until April with its warm days had arrived, has been wide awake and extremely busy all through the summer and early autumn. Then, about the middle of October, each little mouse collects a bundle of moss and leaves and grass, which he rolls into a large ball with a hole in the middle of it; and there he stays, gently snoring, all the winter through.

THE LITTLE SQUIRRELS BELIEVE IN STORING THEIR NUTS FOR THE WINTER.

In the woods the Red Squirrels collect quantities of nuts, beech-mast and acorns, and hide them away in holes in the tree-trunks, or in the ground under piles of leaves or moss.

As the days grow colder, the Squirrel's coat grows thicker, his tail becomes more bushy, and long tufts of hair appear on the tips of his ears. So having a nice warm winter dress, a comfortable bed to sleep in, and stores of food to go to when he is hungry, the Squirrel, as a rule, manages to pass the winter very well.

The Hedgehog does not store up food for hard times, and when once the winter arrives has nothing more to eat until the following spring. So he scrapes together a heap of leaves under a hedge or a pile of brushwood, or in a hollow at the bottom of a tree-trunk. Then he burrows into the middle of it and goes quietly off to sleep.

The only thing the Hedgehog has to fear while he is comfortably tucked up in his nest is a visit from a hungry Badger, who would soon tear open the leafy ball and make an end of the little sleeper within.

As soon as the summer is over the Badger himself begins to make his arrangements for the winter, clearing away every little bit of the grass, fern and moss on which he has rested during the summer, and making a bed of fresh material.

When the weather is very cold and stormy out of doors the Badger stays at home and often has nothing to eat for days together, but whenever it is a little milder he comes out to see what he can find to satisfy his hunger.

WHEN DEER ROAMED WILD IN THE FORESTS OF BRITAIN.

Years ago the Red Deer roamed wild through the forests and over the hills in many parts of the country, but now they lead a free, natural life only on the Scottish Highlands and on the moors of Devon and Somerset.

During most part of the year deer are quite

Who is having the worst of it? The dog is puzzled and does not know how to treat this prickly Hedgehog.

The baby Red Deer seen above, which is only five days old, has long, thin legs and a queer spotted coat. As he grows older the spots will disappear.

harmless animals, but in October the stags grow very fierce and quarrelsome and begin fighting one another.

Tossing their great antlers defiantly, they roam about restlessly over the hills and moors actually " looking for trouble." Their loud bellowing roar may be heard early and late as they challenge one another to combat. After the battles are over, the deer separate and each stag goes away, followed by several gentle hinds, the stronger and bolder among them being leader of the largest parties.

THE STAG IS PROUD WHEN HE GROWS A FINE PAIR OF ANTLERS.

After the winter is over, these family parties break up and every stag wanders away by himself. He is no longer bold and fierce. For the fine antlers of which he was so proud fall from his head, and the stag is then a sad, dejected animal. At this time he is nervous and timid, and hides himself away among the trees or rocks as if he were ashamed of himself.

But this state of affairs does not last long. Soon two little knobs appear on the animal's forehead, they grow very quickly, and before many weeks have passed, the stag is the proud possessor of a fine new pair of antlers, and can hold up his head in the world again.

HOW THE "VELVET" WHICH COVERS THE ANTLERS DROPS OFF.

The new antlers are at first covered with a soft velvety skin, which is very tender, so the stag has to be careful not to hurt them by knocking them against the trees, but gradually the " velvet " dries up and begins to peel off, hanging down in tatters, which make the stag look very untidy. But he sets to work and rubs his new antlers against the ground and the tree trunks until all the skin is rubbed off—and then the stag is himself again.

He does not go back to his family, however. All through the summer he wanders about by himself, or in company with other stags, for at this time of the year they are quite friendly with one another. The older stags generally roam about on the hilltops, while the hinds with their fawns, and the young stags whose antlers are not yet fully grown, keep together on lower ground.

A STAG WHOSE ANTLERS ARE THREE FEET LONG IS CALLED A "ROYAL HART."

A young stag has no antlers until he is a year old, when he grows a short pair without any branches. Each year until he is quite grown up, his antlers grow longer and throw out new branches. When he is six years old he may carry a pair of antlers three feet long, with as many as twelve branches, on his head. He is then called a " Royal Hart." The fawns, strange to say, have spotted coats instead of plain, reddish-brown ones like their parents.

The Wild Cat is like a very big Tabby with a sandy-coloured coat and a thick, stumpy tail. It is so strong and fearless that it will attack almost any animal, no matter how big it may be, and can overcome and kill half-grown fawns and lambs. Once it roamed all over our island, but it is now found only on the hills in the wildest parts of Scotland.

Another very savage animal living up in Scotland and the north of England, as well as in parts of Wales, is the Polecat. It is not really a cat but one of the Weasel tribe, and a relentless hunter.

CAN YOU TELL THE DIFFERENCE BETWEEN AN ADDER AND A GRASS SNAKE?

The Pine Marten, that also lives in the north, is another rare member of the Weasel tribe. He is really a charming little animal with a rich brown-coloured coat, a yellow throat, a fine bushy tail, and a sharp, intelligent-looking little face. He does most of his hunting at night, catching rabbits and rats and mice on the ground, as well as the birds and squirrels in the trees.

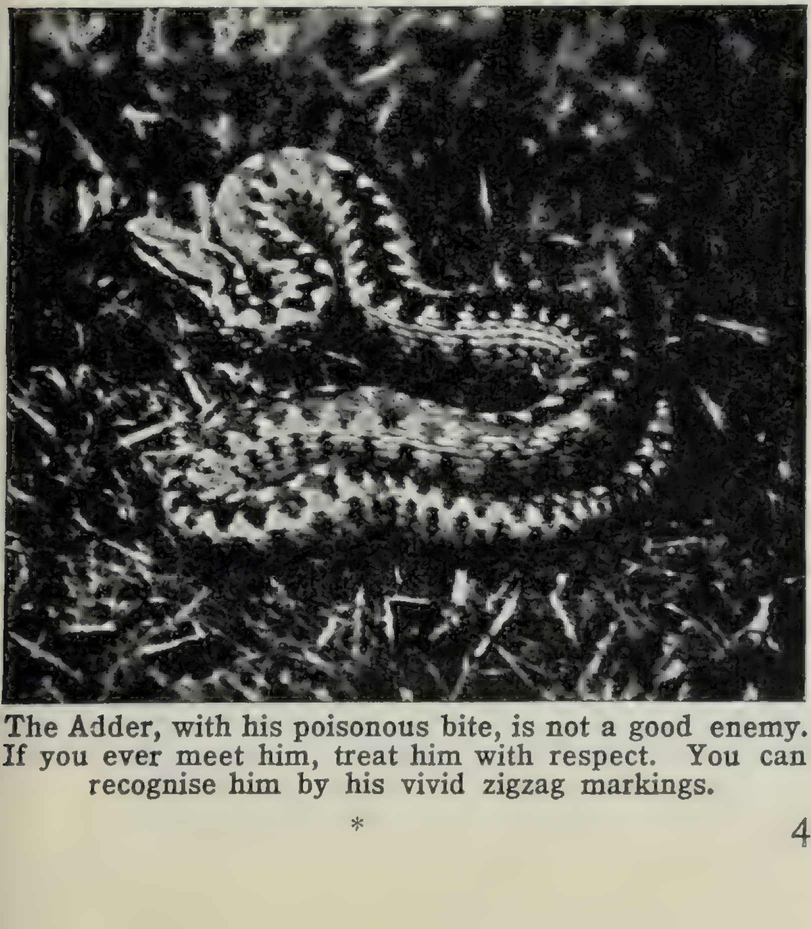
There are three British snakes, the Grass Snake, the Smooth Snake, and the Adder or Viper; only one, the Adder, is at all dangerous.

The Grass Snake is the most common, and is the largest of the three. It is usually about a yard long when it is full grown. Yet in spite of its size the Grass Snake is really quite harmless.

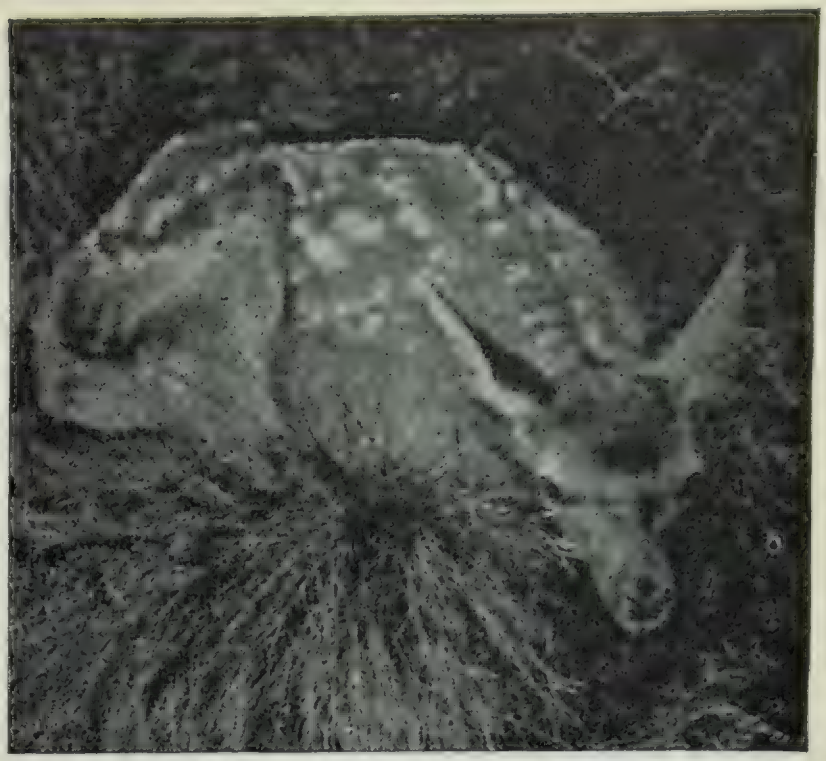
Grass Snakes are handsome creatures. In colour they are olive green on the back, marked with small black spots and bands, and yellow underneath. Round the neck they have a yellow collar and behind this a dark, almost black ring.

These snakes live about the hedgerows and in the woods, and are usually found near ditches or pools.

Now the Adder really is a dangerous snake. Its bite is very poisonous, and although it seldom kills people, it often makes them very ill.



The Adder, with his poisonous bite, is not a good enemy. If you ever meet him, treat him with respect. You can recognise him by his vivid zigzag markings.



The baby Red Deer, tired out after bounding over the hillside, takes his afternoon nap, in his natural surroundings. He is a graceful yet timid creature.

When full grown the Adder is about two feet long, and we may know it at once from the Grass Snake by the black zigzag pattern all down its back, while just behind its head is a distinct black mark, shaped like a V.

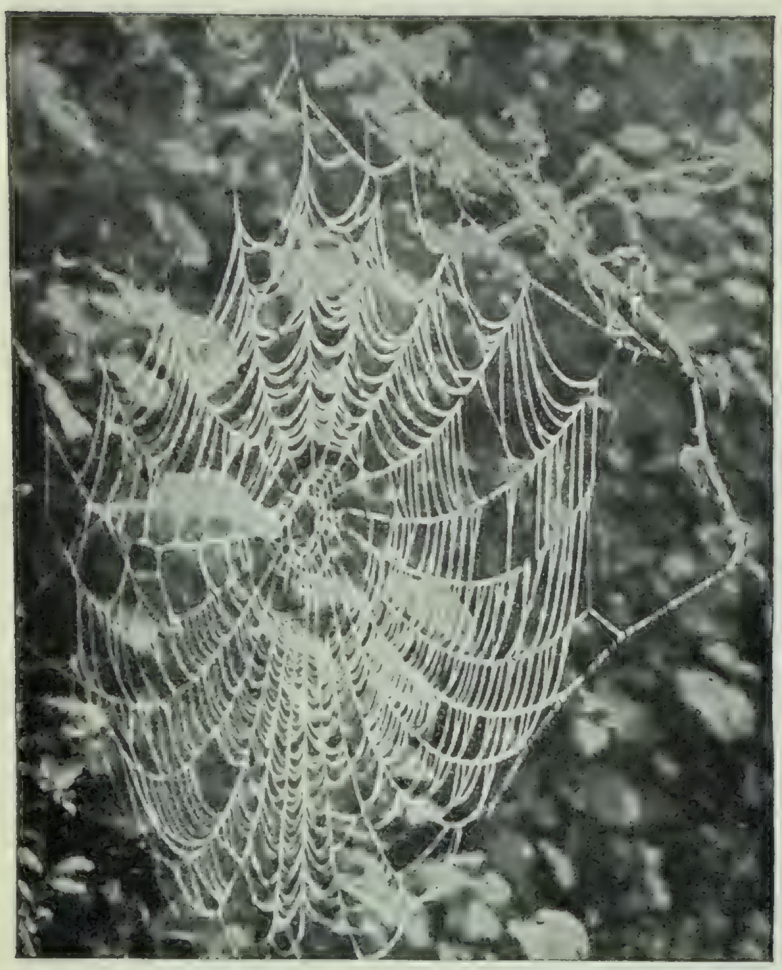
HOW THE SLOW-WORM MAKES ITS WINTER HOME UNDER A STONE.

The Smooth Snake is very rare and only to be found on sandy heaths in a few places in the south of England. It is sometimes mistaken for the Adder as it is much the same size and colour, but it has rows of black spots on its back instead of a zigzag pattern, and a heart-shaped mark behind its head instead of a V. Its bite is little more than a sharp pinch and does no harm.

Sometimes when we are walking in the country, we may come across a wriggling creature that looks like an extra-sized worm or a very small snake. This little creature is a "Slow-worm." It is neither a worm nor a snake, but a legless Lizard. It feeds chiefly on slugs.

When autumn comes the Slow-worm retires altogether under ground or creeps under a stone, and there it lies in a torpid state until spring returns. Snakes, too, begin to look about for winter quarters. As many as a hundred snakes have been found curled up together in a hole among the roots of an old tree.

Anyone who for the first time sees the fields and the hillside covered with gossamer on a fine, October morning might well imagine



Spiders have spun this airy cobweb, which glistens with many colours. They use this net to snare small insects, who are caught on the sticky strands.

he had strayed into fairyland. A lacy veil of silk and silver is spread over the grass and low bushes as far as the eye can see.

This wonderful gossamer is really the work of countless baby spiders which swarm in the fields in the autumn.

Climbing to the top of the grass stems, swarming up bush, fence and gate-post, every little spider raises its body on high and begins to pour forth a stream of silk from its spinnets. When the threads are several yards long, the little explorer lets itself go and sails away at the end of its flying line.

WHY DO SPIDERS WORK HARD TO WEAVE SILKEN NETS?

Spiders use the wonderful silk they spin in many different ways. Some go sailing about on a cobwebby aeroplane. Some spin beautiful little cocoons of white, yellow or gray silk, to keep their eggs safe and sound, and the baby spiders snug and warm ; while others weave snares to catch and hold fast the unwary insects that blunder into them.

Every spider family has its own special pattern for weaving its insect-trap, and every young spider spins its little web in exactly the same way as its mother did, without having a single lesson from any one. The "Orb-weavers," for instance, spin beautifully regular, open webs, like round wheels, with ever so many spokes radiating from the centre.

The burrowing spiders that live underground do not as a rule weave snares, but come out at night to hunt about for prey.

Thus the autumn days go by. Winter is a hard time for spiders. Only a few who have tucked themselves away in some warm corner pass safely through the cold, dark months and live to see another spring.

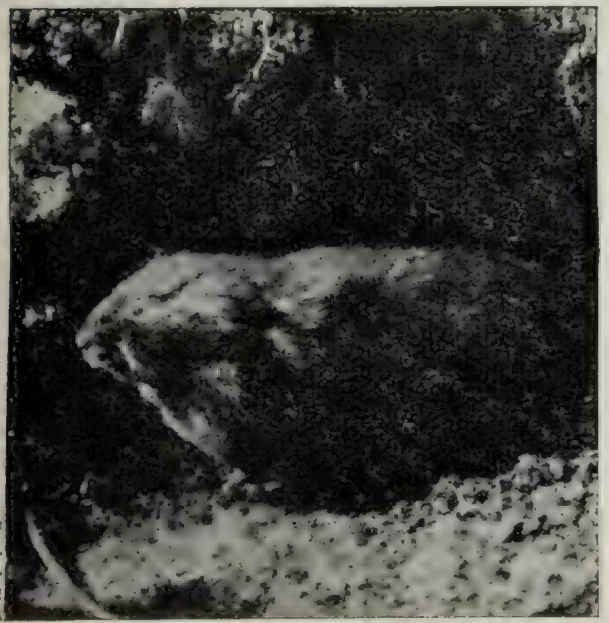
These children seem to enjoy the mellow Autumn days, with their abundance of fruit.

CREATURES OF THE MELLOW AUTUMN DAYS

Dwellers in Wood, Pond and Moorland

The Swallow makes a pretty picture as it flits lightly through the air. The Fallow Deer on the right is a handsome fellow.

The Partridge is on the alert for strange sounds, while the croaking Toad hops about and looks very wise.



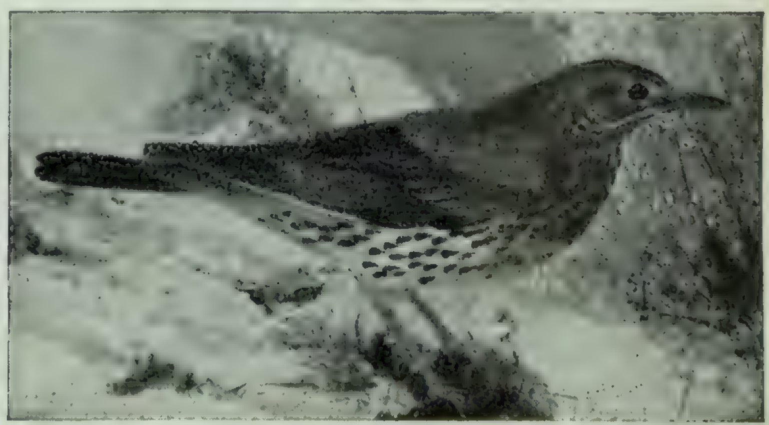
The Water Rat peeps cautiously out from its lair, and the Pheasant struts proudly over his kingdom.

BUSY CHILDREN OF MOTHER NATURE

Some Well-Known Birds—and a Caterpillar

A flock of Sea-gulls fly from their nests on the cliffs to dive beneath the waves for a meal of fish.

These Black-headed Gulls have changed their colour in winter.



The Thrush seeking food in the winter snow.

Are you not glad Caterpillars are not really this size? The photograph has been enlarged to show the creature more plainly.

THE WINTRY SEASON OF SNOW AND STORMS

Does this scene make you shiver, or does it fill you with happy thoughts of skis and sledges and winter sports ?

WE often hear people say, " Oh, yes, the country is very nice in the summer, but I could never stand it in the winter-time ; it is so dreadfully dull." Do you think so ?

There are, to be sure, cold dull days in the country, and blinding blizzards and wild gales of wind when one cannot go out of doors ; but there are, as well, bright, frosty days when it is a joy to tramp along the country lanes, and see the millions of frost crystals turning the world into fairyland. There are days when the fields and lanes and woodlands are hidden under a soft blanket of freshly-fallen snow—so soft, so white, so feathery, that it is a perfect wonder of loveliness. And there are soft, mild winter days when the south breeze stirs the branches of the trees, and birds hop about the hedgerows and twitter happily, thinking the winter has gone.

LITTLE CREATURES TAKE ADVANTAGE OF THE WINTER SUNSHINE.

A wee Dormouse, taking advantage of the break in the cold weather to slip out of his nest in the hedgerow, snatches a hasty meal from the store of nuts and seeds he had hidden close at hand before he went to bed in the autumn.

Little red Squirrel hunts about under the trees in the wood with rather a worried air, as if he were saying to himself, " Dear me, now where *did* I put those acorns ? " But as he always has several store-cupboards near his winter nest, he is pretty sure to find one of his hoards before very long.

How cheering are these bright winter days, saying to us, " If winter comes, can spring be far behind ? " But have you ever thought that if we had no winter we should have no spring ? If it were always summer, how we should miss the joy of finding the first primrose, the coming of the swallows, the awakening of all the little wild creatures from their winter sleep !

THE WONDER AND BEAUTY OF THE WINTER SEASON IN NATURE.

Winter is Nature's time of rest. Yet all the world is not asleep, and we seldom come back from a winter's tramp without having seen something interesting, something new or exciting, to tell those who have stayed at home by the fireside.

The trees are still beautiful, even in the winter-time, in their overcoats of soft brown and gray, silver, green and yellow.

" But the trees do not wear overcoats," you say. Yes, they do. The stems and branches are carefully wrapped up in thick corky coats, the bark, as we call it, which keeps the trees warm and dry, and protects the living wood within from being harmed by frost, soaked by cold rain, or injured by gnawing animals.

Some trees shed their bark once a year ; it peels off in strips, and the trees appear in nice, new, well-fitting cork coats. Others simply fill up the cracks and rents with new corky stuff.

The sturdy old Oak tree, that has weathered a hundred winters or more, is still wearing its first overcoat, all wrinkled and seamed with the hundreds of new patches that have been added year by year.

DO YOU KNOW HOW THE TREES CHANGE THEIR CLOTHES?

Trees that retain their bark in this way are always rough and rugged, and the older they grow the thicker and rougher their coats become; while those that shed their bark have smoother trunks.

Most charming of all is the winter coat of the graceful Silver Birch. It is fine and silky; soft, silvery-white, marked with thin dark lines, and here and there, perhaps, a darker patch where the old bark has not yet peeled off.

The Oak looks so stout and sturdy, ready to face the fiercest gale. Its huge, rough trunk is a tower of strength, and its great twisted boughs, all zigzags and elbows, spread out around it as if nothing could move them.

The cheery Holly-berry, with its bright-red fruit, is a welcome sight in the cold, gray months of winter.

The Horse-chestnut tree is another woodland giant, and the great Elm trees stand erect like soldiers on guard. Their gray overcoats are rather rough and crumpled, as if they had seen much service.

Outside the wood, in open country, or on the slopes of the hills, where it has plenty of room to spread its branches, grows the stately Ash. The bark of the Ash is pale gray, and the resting buds, wrapped up in black, velvety coats, show plainly among the greenish-gray twigs; while clusters of winged keys, all copper and bronze, still hang from the bare boughs and glisten in the winter sunlight.

The tall, upright trunks of the Beech trees are clothed with smooth, satiny bark, shading from gray to green.

In the summer-time the boughs of the trees, crowded with leaves, cast so dense a shadow on the ground below that few plants are bold enough to attempt to live under the proud Beeches.

HAVE EVERGREEN TREES TIME TO REST IN THE WINTER?

In winter when the trees are bare we really feel quite grateful to the Holly and the Ivy, and all the other evergreen trees and shrubs, that make such a brave show with their glossy green leaves and bright berries in the cold, dull days.

But what are they doing, these bold evergreens, to be awake when all the plant world is sleeping?

Well, the evergreen plants are not really awake. The leaves are no longer busy food factories, working away from morning to night; they are now store-rooms, in which the evergreens keep their food supplies stored up all through the long winter months.

The Holly stands in the woods or by the wayside, defying the hardest frosts and the fiercest gales, and threatening grazing animals with its array of prickly spines, while its bright red berries provide a welcome feast for hungry birds.

HOW IVY CLINGS AND CREEPS ROUND TREES AND UP WALLS.

The Ivy is quite a different kind of plant. While the Holly stands proudly alone, the Ivy winds itself round the trunks of trees, climbs up walls and creeps over old ruins in its lifelong struggle to find a place in the sun.

All along its stem the Ivy has numbers of finger-like rootlets, called "aerial roots." These fix themselves firmly to the bark of the

The Dormouse is a sleepy little animal, and hates to leave his snug nook when snow lies thick on the ground.

poor tree and pushing their way into every crack and crevice, drain away its strength. So unless it is torn away from the tree, the Ivy will kill it in the end.

Holly and Ivy we will find growing in almost every wood and country lane, but to find the Mistletoe is not so easy. It lives high above our heads, perched aloft on the branch of a tree.

Not every tree suits the Mistletoe. It will grow on an Oak, but likes best to find a lodging on an Apple-tree or a Pear-tree in the orchard, or to perch itself high up on the boughs of a Black Poplar.

THE MISTLETOE IS IN GREAT DEMAND AT CHRISTMAS TIME.

For its lofty position the Mistletoe has to thank its friends, the birds, who eat the juicy white berries, carry away the seeds, and plant them down on the branches of other trees growing round about. In the spring the baby Mistletoe plant begins to stir and grow. It sends up a green stem and puts forth its pale green leaves; while its roots push their way along under the bark and tap the water supplies that the tree is sending up for its own shoots and leaves.

When we have gathered Holly, Ivy, and Mistletoe to make our rooms gay, we must go to the Fir woods for a Christmas-tree. There the Fir-trees stand, big ones and little ones, holding out their feathery branches as if they were just waiting to be hung with presents and lit up with coloured candles.

The tall Pine-tree and the Fir-tree brave the winter in much the same way. Their fine needle-like leaves save them from the dangers of wind and snow. Although the leaves of both are so narrow they are very thick, and protected from frosts by a thick, glossy skin.

HOW THE SMALL CREATURES OF THE WILD LIVE IN COLD WEATHER.

Snow, when it stays too long on the ground, means terrible hardship to most wild creatures. True, some of them (the Dormouse, the Squirrel, and the Hedgehog) are safely curled up in their warm winter nests; while Mice and Rabbits have homes in the ground, in which they can stay during the worst of the weather.

But birds have no homes to go to and no stores laid up for the winter. Numbers of Thrushes, Field-fares and Blackbirds nestle together on the sheltered sides of banks and hedgerows. Wee Wrens and Titmice, Robins and Sparrows, creep under the thatched roofs of the cottages, into holes in old walls, or huddle under the thick masses of Ivy, patiently waiting for better days. Flocks of Larks and

The Mistletoe is careful which tree it chooses to grow on. It likes best to lodge on an Apple-tree or a Pear-tree.

Linnets flutter about the fields hoping to find a few seeds or grains, but all food supplies are buried deep under the snow.

Now is the time to remember our "poor brothers," as good Saint Francis called the birds he loved so well. If food is put out regularly for them, all sorts of birds will come flocking to the feast from far and near. It will be a delight to watch our little winged guests enjoying their breakfast, and to look out for the rare visitors who will come from time to time to join the throngs of the bolder Robins, Thrushes, Blackbirds, Tits, Starlings and Finches.

THE CHEERY ROBIN REDBREAST IS OUR MOST WELCOME WINTER GUEST.

Robin Redbreast is the most friendly and confiding of all our winter guests. He is so sure of his welcome, and soon makes himself at home.

The Chaffinch is another trustful visitor. The Bullfinch will often join the bird party as soon as the supply of berries in the woods and lanes is exhausted.

Sometimes the Tree-creeper and the Nuthatch (two shy little birds that creep about so quietly on the tree trunks that they are seldom noticed when the leaves are on the trees) will come in from the woods in search of a few stray crumbs.

The Tree-creeper is a tiny, mouse-like bird, with a long, slender, curved bill, and long, curved claws. The Nuthatch is slightly bigger, with soft chestnut-coloured feathers on its breast and sides, and a bluish-gray back and head.

In hard times Tree-creepers and Nuthatches often join parties of Tits, and the hungry little birds wander over the country-side together in quest of food.

The Ptarmigan changes to a white dress in winter so that it can hide in the snow from its many enemies.

Two cousins of our English Thrushes and Blackbirds, the Field-fare and the Redwing, come regularly to visit their relations in this country as soon as the cold northern winter sets in.

They come all the way from Iceland, Northern Russia, Norway or Sweden, where they have spent the happy summer months building their nests and bringing up their young ones.

SOME SHY BIRDS WHICH SPEND THE WINTER WITH US.

When the Field-fare and the Redwing first arrive, about the middle of October, they have quite a good time. There is plenty to eat, lots of nice fat grubs in the ploughed fields and lots of fruit and berries on the trees and bushes. But when really cold weather comes, when snow covers the ground and food grows scarce, our little visitors are not so happy. Unfortunately both the Field-fare and the Redwing are very shy and wild, and refuse to join their cousins, the Blackbirds and Thrushes, when we put out food for our bird friends in the garden.

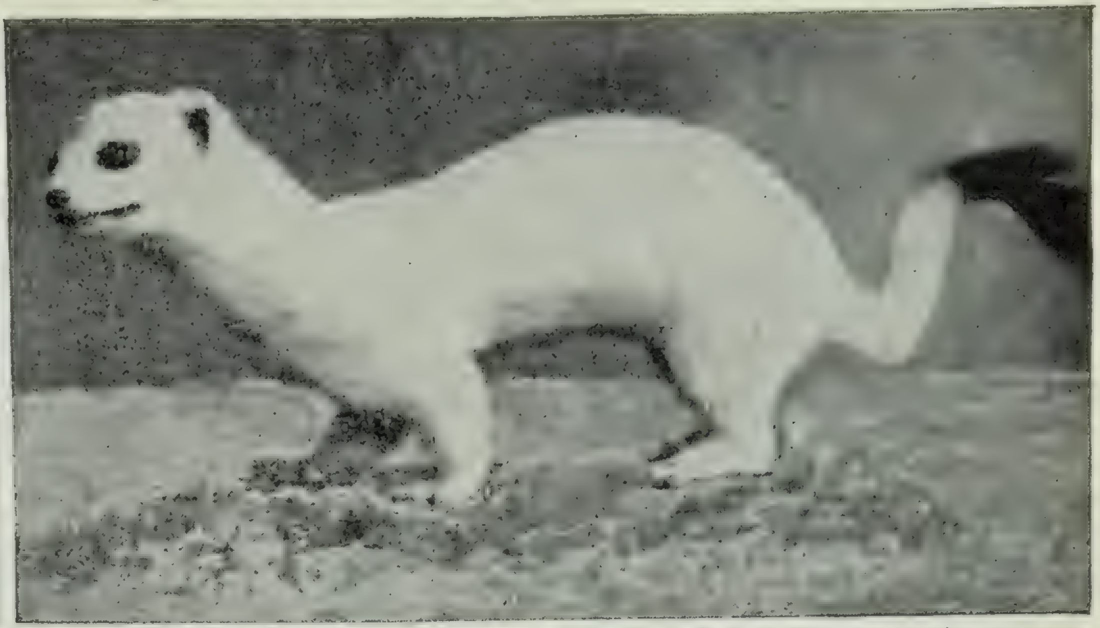
The Field-fare is a handsome bird, very much like our own Song Thrush. He has a spotted breast, but the feathers on the lower part of his back are bluish-

A snowy scene showing both the gloom and the icy beauty of winter.

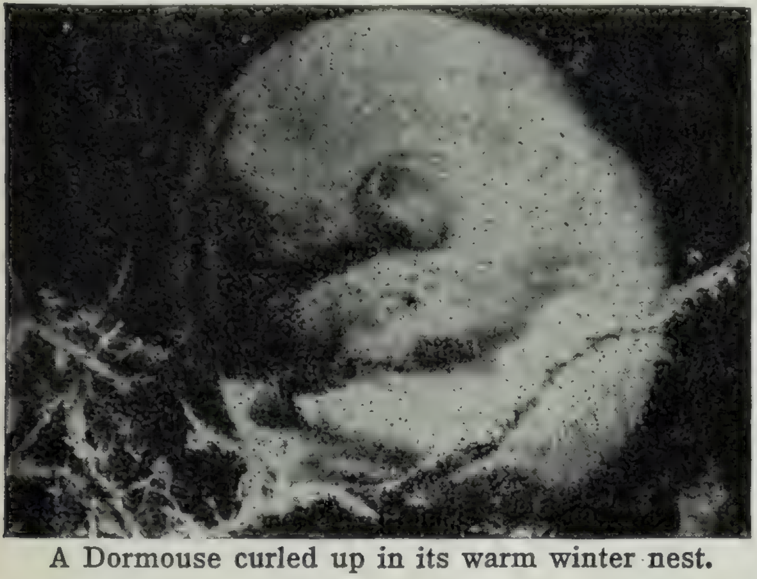
WINTER DAYS: WHEN FOOD IS SCARCE

Who is the only Winter Sleeper here?

This Rabbit seeks its food in the snow.



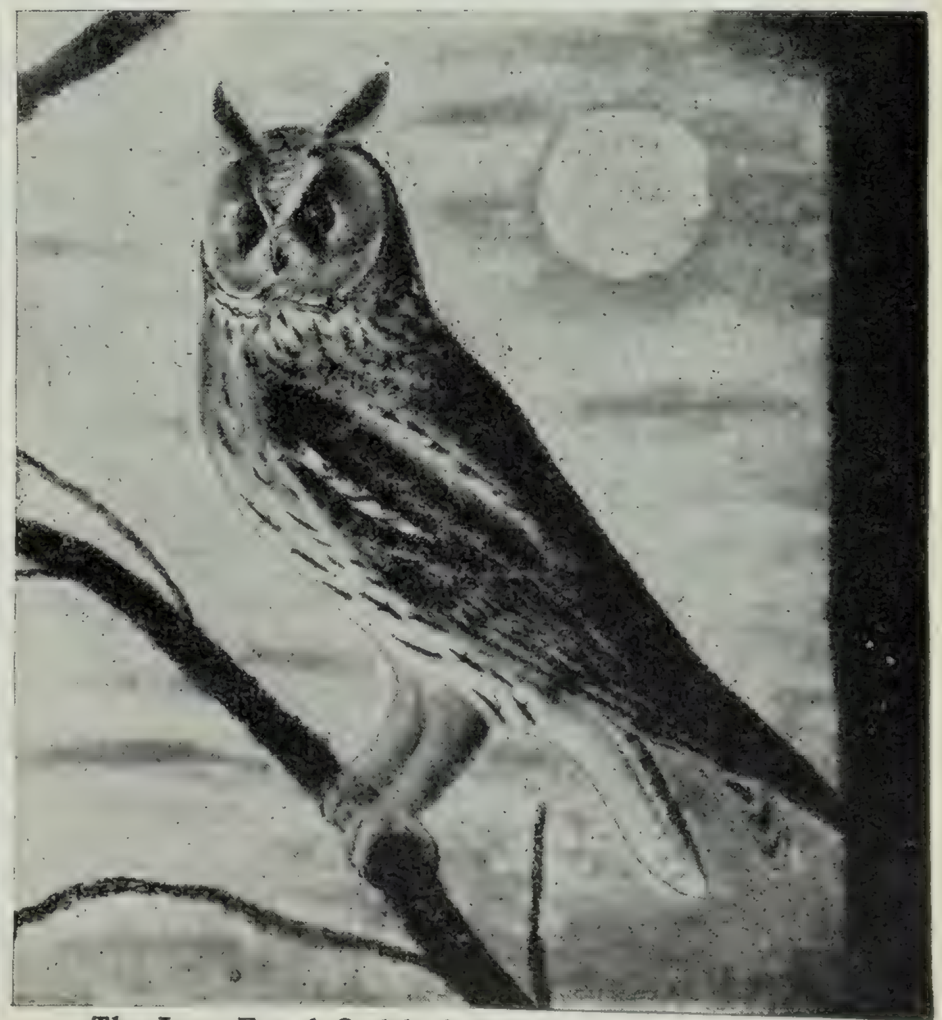
The Stoat's coat changes to white in winter—for protection.



A Dormouse curled up in its warm winter nest.

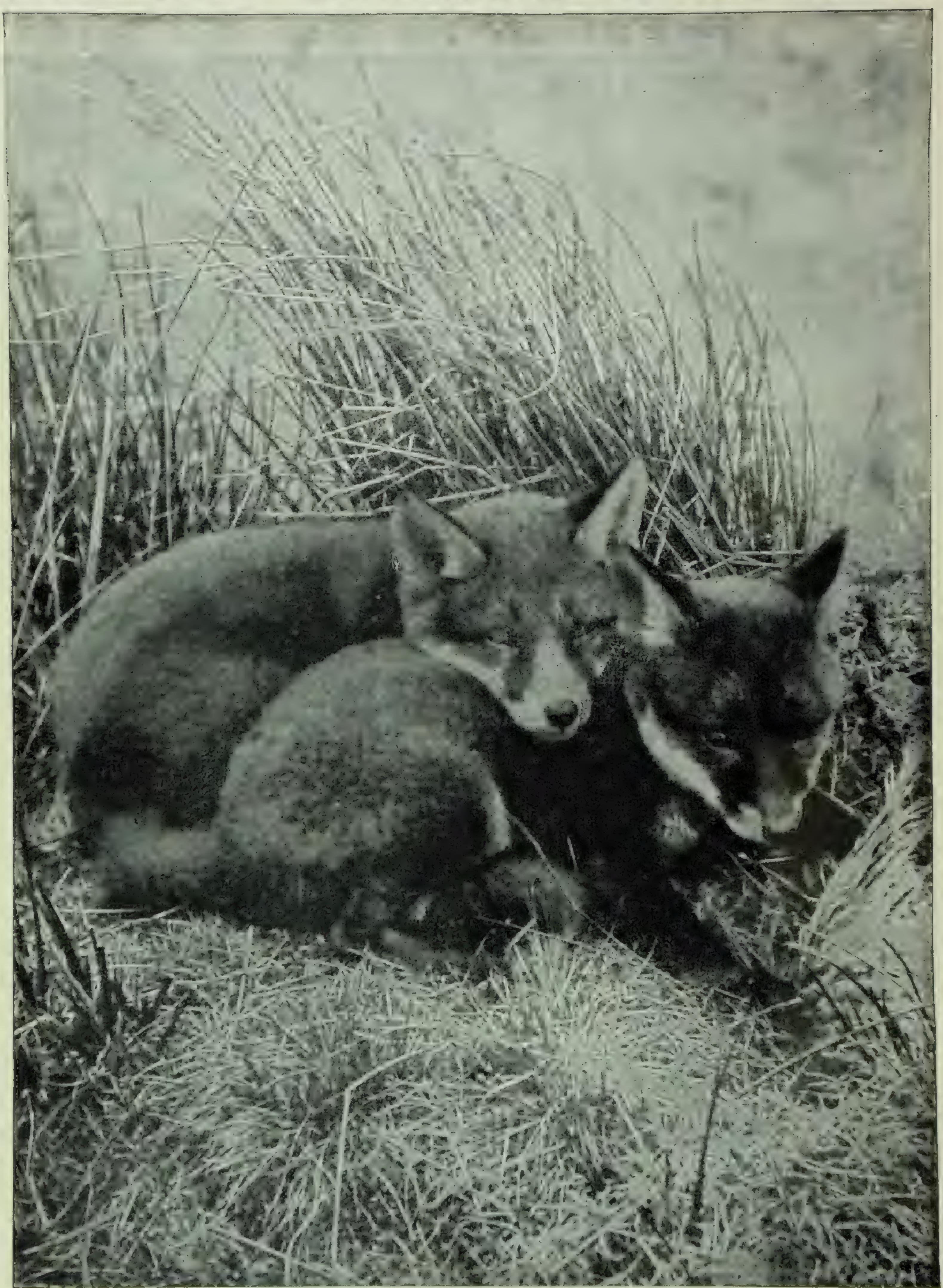
The Otter seeks his food inland when winter seals his waters.

The Chaffinch is a hardly little fellow.

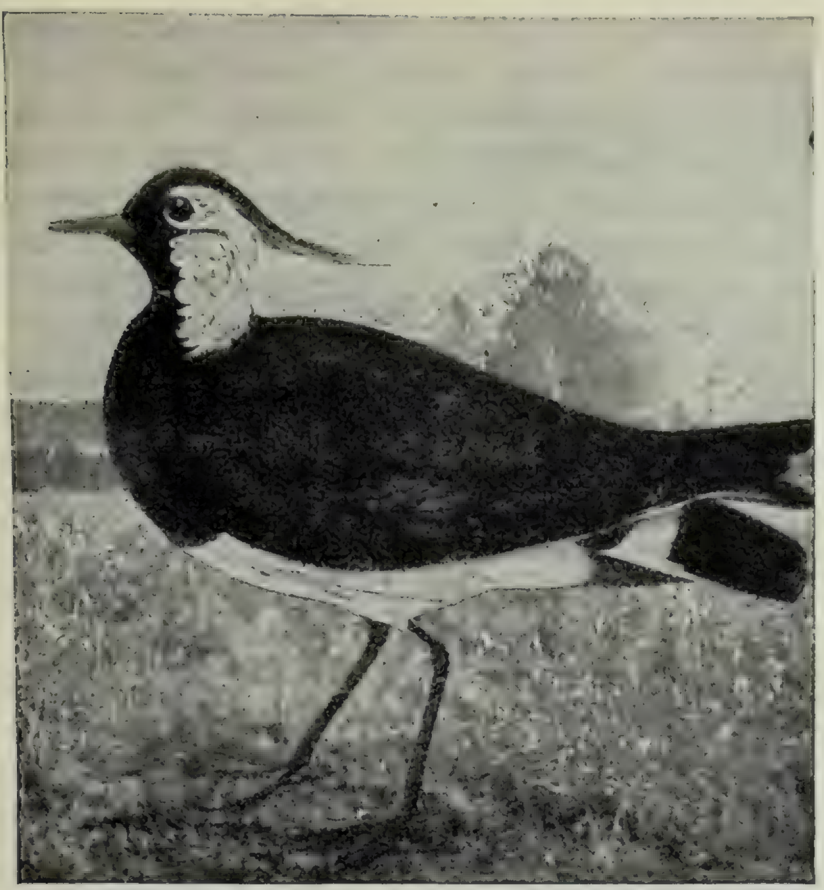


The Long-Eared Owl looks very wise—and alert too.

TWO GOOD COMPANIONS OF THE WILDS



Two frisky young foxes, tired out after their gambols in the woods, take a few moments' rest before beginning another game. They make a pretty picture with their soft, chestnut-coloured fur. They have to learn to fend for themselves at an early age, and farmers near their den soon learn of their existence, for fowls disappear from their yards.



The Lapwing is found in Europe and Asia and spends the winter in India and Africa. Its eggs are laid on the ground and are often sold and used for cooking.

gray instead of brown. The Redwing is a smaller bird, with a soft brown coat, a spotted breast, and a reddish patch of feathers on each side.

Our own Thrushes, although they suffer very badly from the cold at times, manage better to live through the winter than their northern cousins. The Song Thrush will come regularly into the garden for food, and will often find food for himself even in the coldest weather.

DO YOU KNOW WHAT HARDY BIRD IS CALLED A "SNOWFLAKE"?

The Song Thrush sings almost all the year round, but the Missel Thrush is the most famous of winter singers. On the coldest, wildest day, perched aloft on the topmost bough of a tall tree, he will sing and shout as if he quite enjoyed the wintry weather and loved being tossed about in the wind.

Luckily for our "poor brothers," very cold weather does not, as a rule, last for very long in England; and unless the winter is unusually severe most of our home birds, at any rate, can live through the hard times, till spring returns to fill them with joy and happiness again.

Flocks of charming little visitors come every year all the way from Iceland, Lapland, and the northern parts of Russia, to spend the winter months on the snow-clad hills and moors of Scotland, or in bleak, desolate parts of the country in the north and east of England.

Chief among these hardy little travellers are the Snow Buntings, or "Snow-flakes."

In the summer-time the "Snow-flakes" are white with some gray feathers on the back and in the wings and tail, but when they visit us in the winter they are dressed in coats of speckled brown. Their breasts, however, are still snowy white, and as they come fluttering down in a cloud, from a cold gray sky, the birds look like a shower of very large snow-flakes—and from this they have gained their pretty name.

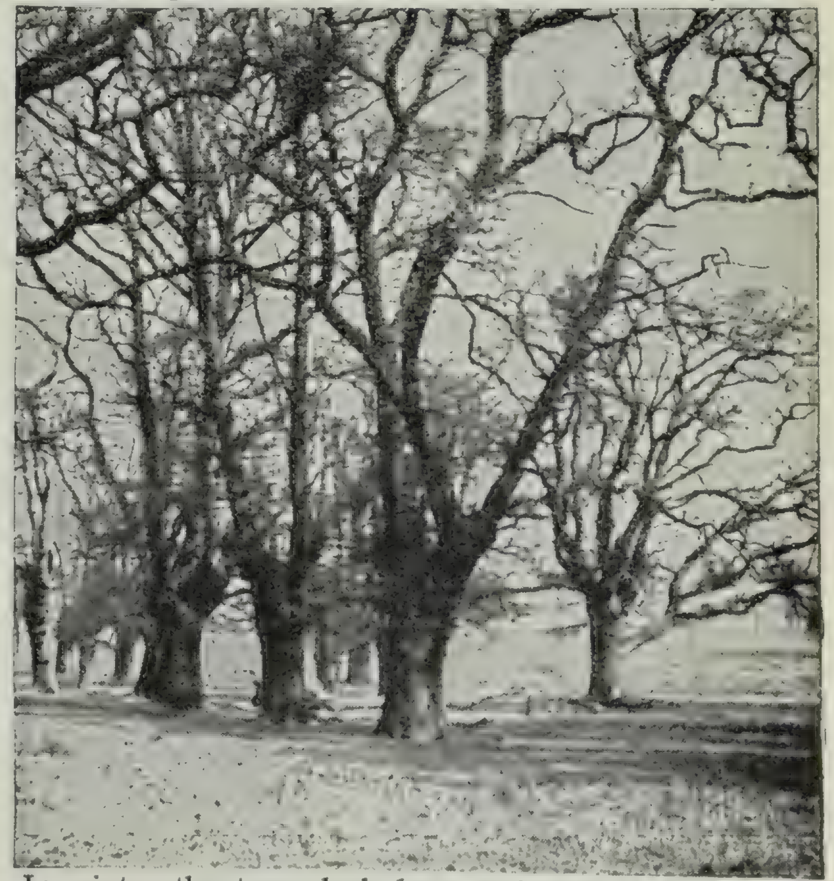
As soon as winter is over, away fly the "Snow-flakes" to their summer home far up in the Arctic Circle.

SOME WINTER BIRDS WHICH PAY US VISITS EVERY YEAR.

The Siskin is another winter visitor. It is a tiny greenish-yellow bird, not much bigger than a Blue Tit, and in the wintry sunshine looks almost like a Canary. The Siskin does not visit us quite so regularly as the Snow Bunting does.

Just as uncertain in its ways is the pretty and interesting Cross-bill, a stoutly-built little bird, with a short tail, strong feet, and a very curious bill. The two points of the beak cross over in different directions, instead of coming together at the tip as the beaks of other birds do. It feeds chiefly upon the seeds of the Larches and Fir-trees, and its crossed bill makes a capital tool for forcing open the cones and hooking out the seed which lies at the base of each scale.

Most game birds are strong and hardy, able



In winter the trees look bare and cold, but in reality they are wearing cosy overcoats. Their stems and branches are wrapped up in bark to protect and keep them warm until the spring comes again.

to brave almost any weather, particularly those that live on the moors in the north of England and in Scotland.

Red Grouse pick up a scanty living of seeds and berries among the heather, then come down to lower, more sheltered ground, until the worst of the winter is over.

The Ptarmigan, or White Grouse, lives all the year round on the bleak, rocky mountain-tops in the Scottish Highlands.

One very interesting thing about this mountain bird is the way his plumage changes with the different seasons of the year. Ptarmigans have three complete new suits every year. In the winter, when the tops and the slopes of the mountains are covered with snow, they are clad in pure white feathers to correspond with the snow-covered landscape.

Thus they are protected by their plumage from falling an easy prey to the prowling Fox or the great Golden Eagle, who are the chief enemies the Ptarmigans have to fear.

HOW THE OWLS SPEND A BUSY NIGHT WHEN THE WORLD IS ASLEEP.

"Whoo-hoo-hoo-oo!" It is a bright frosty night and the Owls are out, sweeping low over the fields, beating along the hedgerows, and swooping round and round the corn-stacks in the farmyard, as they eagerly hunt for their supper.

It is the big Brown Owl that hoots. The Barn Owl shrieks when it is out hunting, or makes a noise like a cat spitting. The Barn Owl, or the White Owl, as he is sometimes called, spends the day humped up in some dark corner in a barn, in a church tower, or in an old Ivy-covered ruin. He is a most handsome bird, with a snowy white breast, and soft buff feathers on his back and wings, speckled with dots and dashes of brown, gray and white.

THE SOFT, WHITE BARN OWLS INCLUDE MICE IN THEIR DIET.

At night he is wide awake. He leaves his home in the twilight and often hunts his prey until the dawn, when the first streak of light in the sky sends him back to his hiding-place. He kills so many rats and mice that he is really a most useful bird, and one of the farmer's best friends.

Baby Barn Owls are the funniest little creatures, covered with soft, white, downy feathers right down to their toes, which makes them look as if they were dressed in long, white night-gowns. They stay in their nursery for quite a long time, and Father and Mother Owl have as much as they can do to catch enough Mice to feed their five or six hungry little Owlets all through the spring and summer time.

The Brown Owl, or the Tawny Owl, as it is sometimes called, prefers to live in the woods.

Before his long winter rest the Squirrel has a busy time replenishing his larder with a store of berries and nuts.

He, too, is a fine, handsome bird, dressed in a feathery coat of mottled brown and gray. He has beautiful amber eyes, surrounded by flat frills of pale brownish feathers, and looks wonderfully wise and solemn.

THE BROWN OWL, WHICH LOOKS LIKE A LITTLE BALL OF FLUFF.

In the spring-time the Brown Owls make their nests in holes in trees. Young Brown Owls are odd-looking little balls of fluff, with big round eyes and very sharp claws. They are cross little things, and hiss angrily if you dare to look at them.

While the Brown Owl loves the Oaks and the Beeches, the Horned or Long-eared Owl is happier in the Fir and Pine woods, where he usually spends the day perched up high on a lofty branch pressed close against the tree-trunk. His mottled brown and orange feathers tone so well with the colour of the tree-trunk that he is very seldom noticed. If he is disturbed, the Owl has a funny habit of raising the two long tufts of feathers on his head. These, by the way, are neither ears nor horns. They are just long feathery plumes that stand upright on the bird's head.

Owls do not suffer in cold weather as smaller birds do. They have thick, soft, feathery coats, which are as warm as eiderdown quilts ; moreover, as even in the frostiest weather numbers of little animals are sure to be about in the evening looking for something to eat, Mr. and Mrs. Owl seldom go hungry to bed.

WHEN WINTER COMES THE GULLS ARE NEVER FAR BEHIND.

Every year when winter comes, the Gulls come flocking into town and village to spend the cold months of the year with us.

Some of the Gulls fly inland early in the autumn ; others come later, and do not leave their summer home until driven in by bad weather ; usually they follow the course of the rivers. Wonderful birds they are, too, with their snowy breasts and great white wings.

The Gulls that come up to town and are seen about the countryside in the autumn and winter are the Black-headed Gulls. They never really have black heads, though in the spring-time, when all birds wish to look their best, they wear dark brown hoods, which with their soft gray and white plumage, red beaks and red legs look very smart indeed. The Black-headed Gull is sometimes called the "Laughing Gull." These Gulls are very good friends to the farmer, for large flocks will follow the plough and gobble up the grubs as fast as they are turned up from the ground.

Many kinds of Wild Duck visit our ponds in cold weather. Lack of food drives them to seek new lands in winter.

Sometimes a few Herring Gulls join their Black-headed relations in the fields and help in the good work. They, too, have white and gray plumage, but they are bigger than the Laughing Gulls and their beaks and legs are a pinkish yellow colour instead of red.

HOW WILD BIRDS ARE DRIVEN TO OUR SHORES IN COLD WEATHER.

Herring Gulls are bold birds, wilder in their ways than the Black-headed Gulls. They make their nests on narrow rocky ledges high up on the face of the tall cliffs, or on the grass-covered tops of small, uninhabited islands right out to sea, where they are not likely to be interfered with.

Among our winter visitors we have several kinds of Wild Duck, driven in from colder lands when ice and snow cover their food supplies ; and we may sometimes hear the "honk, honk !" of a flock of Geese as they pass overhead on their way from colder to warmer lands.

To the coast, too, in hard, wintry weather come flights of Wild Swans. Great, glorious birds with long, graceful necks, and strong white wings which have carried them safely all the way from Iceland, Lapland and the Northern parts of Europe. These Wild Swans are the Whooper or Whistling Swans—so called from the wild, whistling cry they give as they wheel and circle high in the air.

When the earth is frozen over in winter the little creatures of the wild have a hard task to find food.

Winter is a hard time for many of our four-footed friends. Some little creatures, as we know, collect a private store of provisions in the autumn to help them through the bad times, but others have no store-cupboards to go to, and are forced to leave their homes whenever they are hungry to look for something to eat.

To get over this difficulty, a few wise beasties simply go to bed and stay there, until the bare, cold months have passed and spring returns once more.

SOME SLEEPY LITTLE CREATURES WHO TRY TO ESCAPE THE WINTRY WIND.

Soundest of winter sleepers is the Hedgehog. In the autumn he rolls himself up in the middle of a thick mass of leaves, in a dry ditch or among the roots of an old tree, and never stirs or opens his eyes until the winter has quite gone.

The Bats, too, have hung themselves up for the winter in all sorts of dark, sheltered nooks and corners.

The Squirrel and the Dormouse do not sleep quite so soundly, but wake up now and again, when the weather is mild, to take a peep at the world outside, and nibble some of the nuts and seeds they hoarded up before they retired to bed.

Mice and Rats are not much disturbed by the cold. Most Field Mice have stuffed their underground runs with good things, while some take up their winter quarters in corn-stacks, where there is food in plenty all around them.

Rabbits also do not fare so badly; they have warm burrows to shelter them. Although they have no food stored away, they can generally manage to find something to eat unless the ground is frozen hard. Hares have a harder time than Rabbits when the cold is very great. Having no underground homes to go to, they are obliged to stay out of doors whatever the state of the weather. But Hares are hardy

A cold and frosty morning! How would you like to swoop along this ice-bound river on your skates?

The Fox does not mind the cold weather. He is safer when the ground is frozen too hard for his enemies, the hounds and huntsmen, to join in the chase.

animals, and are accustomed to living right out in the open all the year round.

The Hare does not mind the cold very much as he has a thick fur coat to keep him warm. But when the ground freezes and there is hardly anything to eat he grows very hungry, and often travels long distances over the snow or frozen ground in search of food.

WHY DO SOME ANIMALS CHANGE THEIR SUITS IN WINTER ?

All animals have warmer coats in the wintertime to protect them from the cold. Their fur grows thick and long, and often changes in colour. The Hare's winter coat is almost gray, instead of ruddy brown, as it is in the summertime ; while the Mountain Hare, that lives on the hills in Scotland, grows perfectly white when the snow is on the ground.

This white coat is a protection to the Hare ; for when all the land is covered with snow, it hides him from the sharp eyes of the hungry Fox and the cunning little Stoats when they are out hunting for a meal.

But up in the north of Scotland the Stoat, too, has a white winter suit ; so although the Hares and Ptarmigans may sometimes escape the eyes of this fierce little hunter they do not always see *him*, as he moves swiftly and silently towards them over the snow. The Stoat in his winter dress is called the Ermine. He is then white all over with the exception of his funny little tail which always remains black.

Farther north still, in the Arctic regions, even the Fox puts on a white winter coat which matches the desolate wastes of ice and snow, and helps him to steal unawares upon his prey.

Deer can stand very cold weather so long as they are able to find enough to eat, for their hairy coats are thick and warm. They scrape away the snow with their hoofs to find the scanty grass and moss growing beneath it, and in very severe winters they have been known to make bold raids on the haystacks in the farmers' fields.

Sly Reynard the Fox has his "earth" to shelter him. The cold does not trouble him much and he can always find something to eat. A hard winter is really a fortunate thing for Master Reynard. When the snow lies deep, or the ground is hard and slippery with ice, he is

"I know a thing or two," says the wise old Owl, with a sly wink. Have you heard his queer screech as he flits about on his nightly prowl for food ? [*J. Williamson* safe from hounds and huntsmen. A soft mild winter means good hunting weather, and then day after day the Fox may have to run for his life.

Our friend the Otter is very hard pressed in wintry weather ; when ponds and streams are frozen over, " good-bye " to his fishing ! He will search the banks of the stream, hoping to surprise a Wild Duck or a Moorhen asleep, and if he has no luck he will go loping over the fields hunting any small creature that happens to be abroad.

Old Mr. Badger is another who does *not* enjoy the winter. To be sure, he has a den deep in the earth where frost and snow cannot harm him, and a comfortable bed of grass and fern to lie upon, but he has nothing to eat, for unlike the gay little Squirrel he has made no provision for wintry days, and his larder is empty. So whenever the weather is a little milder, he comes rolling out of his home and wanders about looking for something to eat.

HOW THE BEES SPEND WINTER HANGING IN CLUSTERS IN THE HIVE.

A mild winter is by no means a good thing for the insect world. In the hive it makes the workers restless. They eat more honey, and their stores may be all gone before they are able to gather in fresh supplies.

A very cold winter, however, is even worse, for the Bees may become so chilled that they have no energy to eat the food they have so carefully stored, and may die in the midst of plenty.

As soon as cold weather sets in in earnest the Bees cluster together in the centre of the hive, where they hang down like a big bunch of black grapes, with their precious queen in the middle.

They are constantly changing places with each other, those in the middle of the bunch, which is, of course, the warmest place in the hive, giving place to their companions on the outside before they grow too cold. Sometimes the poor Bees are deceived by the sun shining on the snow into thinking that it is summer outside the hive ; and those who go out to see are often so frozen with the cold that they cannot struggle back to the hive again.

HOW THE DEAD EARTH WAKES TO LIFE AND SPRING ARRIVES ONCE MORE.

Then, they are sometimes worried by homeless Mice, who creep into the warm hive and settle themselves there for the winter. And they are also in danger from hungry birds who, although they cannot get inside the hive, are quick to snap them up whenever they show a wing out of doors.

But hard times do not last. Winter is passing. The world will grow green and flowers will bloom again, and the Bee-hive will hum with joy and excitement. On every branch new buds are waiting, wrapped up in their warm winter coats, ready to deck the trees with green again, as soon as they are touched by spring's magic wand.

After a farewell song our winter guests must go, but other birds come flocking in from far and near. Soon the world will be full of song, and the happy, busy round of life begin anew.

Three labourers get busy in the fields, turning over the rich, brown soil, to prepare for harvest.

The tawny Lion, King of Beasts, takes his fitting place at the head of our section on the world's wild life.

WILD LIFE OF THE WORLD

We all love to gaze at wild animals, even though we can only see them in zoos. There is something so beautiful in their movements, their habits, their soft eyes that tell us so much of what they think of us. Some animals are blessed with graceful forms and swiftness of movement. Others are ugly and ungainly. But they all speak to us of wild regions of the earth, of freedom and life as it is lived where men have not invaded nature's realm by building cities, towns, roads and railways. Here you will be able to read of the various families of living creatures, animals, birds, and reptiles, and see pictures of some of them. Many of the pictures are photographs taken at great risk by travellers and photographers. Much courage and patience is needed for the task of wild animal photography.

MANY animals—indeed, most animals—have points which when you come to think of them are very like those of people. The fox is a sly old fellow, the chattering monkeys cheeky and forward, the bear gruff and surly, the ox placid and gentle. Apart from his usefulness, the horse has so many fine characteristics that we call him a "noble" animal, and count him worthy to rank, along with the dog, as the "friend of man." He has pride and intelligence. In his natural state he is wild, shy, spirited; bad-tempered sometimes, but never mean or greedy, like some of the animals.

His origin takes us right back into the past, to the far-off time known as the First Stone Age. The men of those days lived in caves. They had not learned how to work metals, so all their tools and weapons were of stone. Strange to say, they hunted the wild horse for food, killing principally the little long-legged foals. These they dragged home to their caves and feasted on, leaving only their bones to tell their story to the modern scientist. Those primitive horses of course were not quite like the horses we see in Britain to-day. They were more like the wild horses which are still to be found on the Mongolian steppes, or their beautiful cousins the zebras. Like these, they must have had vast empty grasslands over which to roam.

After the Early Stone Age the wild horse disappeared altogether, to reappear much later when primitive man had become more civilised and learned to use implements of iron and bronze. Still he was hunted for food.

Then seeing his strength and fleetness, some one at last had the brilliant idea to tame him and ride on his back. One can imagine what this solution of the transport problem would mean to these nomadic peoples, who lived and sought their food on the great plains.

Ancient civilised countries such as Egypt and Assyria used the horse in warfare. We

Old carvings show us that the Egyptians and Assyrians used horses to draw their chariots in warfare.

read how, with their "horsemen and chariots," the Assyrians spread their dominion far and wide, and struck terror into the hearts of their enemies. Even to-day there is something splendid and terrifying in the thought of those mighty hosts.

HOW THE GREAT BLACK WAR HORSE RODE INTO BATTLE.

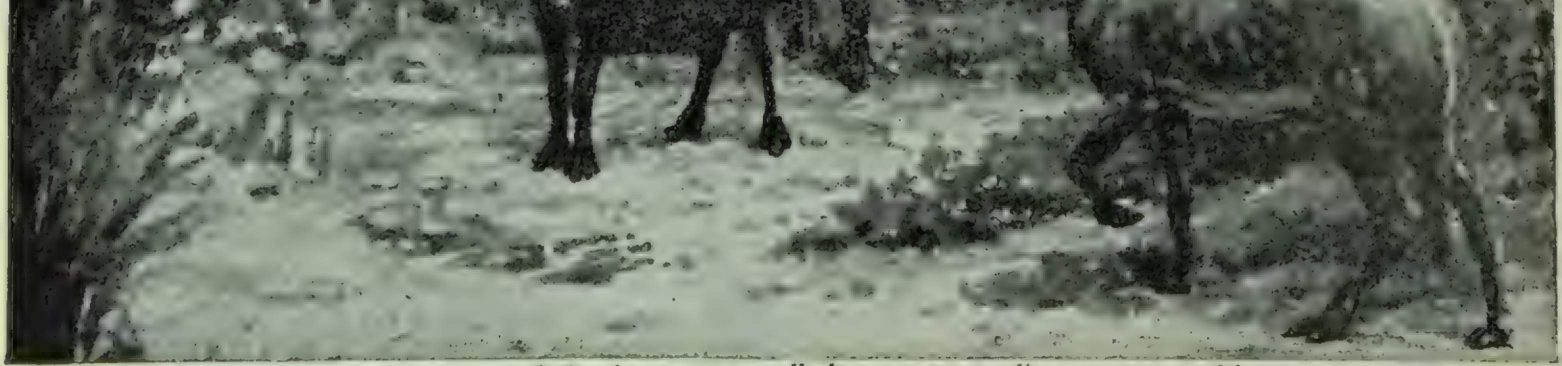
These horses were the ancestors of the famous Arab, Barbary and Turkish steeds, and we must suppose that from Asia came our own horses also. Strong and indomitable, the great Black War Horse of the Middle Ages rode into battle, carrying a mailed warrior on his back and taking the shock of the charge like a hero. He must have been a mighty fellow to carry so vast a weight of metal! But he bore it well—snorted and pawed the ground, and arched his beautiful neck, while fire flashed from his eye and smoke breathed from his nostril.

War chargers are no longer wanted, and modern cavalry is drawn mostly from horses of the light hunter type. But the descendants of the big black horses are with us still as draught horses, Shires and Clydesdales, whose great hairy hoofs ring on the cobblestones as they draw huge loaded drays to and from the docks.

Lighter than these but strong and sturdy were the Hackneys of the old coaching days. We may picture them rolling along on their lengthy, adventurous journey. Suddenly with a clatter of hoofs and pistols a horseman draws up, masked and grim. A hold-up! A highwayman! Perhaps it is Dick Turpin himself, and his horse the very Black Bess on whom he rode from London to York!

Nowadays motors and motor coaches have almost entirely displaced horse-drawn vehicles, and there is scarcely a horse to be seen in our streets. Still we may see him in perfection on the racecourse or the hunting field, where he shares with the pink-coated huntsmen the joy of the chase.

The nearest approach to wild horses which we find in our own land are the little Celtic ponies which flourish in some parts of



The Eohippus, as the ancestor of the horse was called, was a peculiar creature with toes on its feet.
[*Courtesy Am. Museum of Nat. History.*

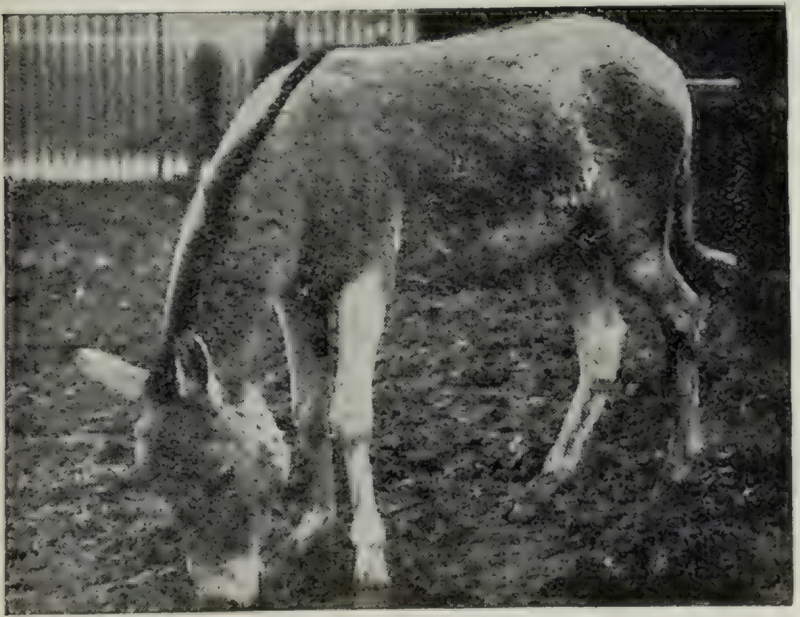
the country—Shetland ponies, Highland and Welsh ponies, New Forest ponies and others. The Shetlands are the smallest, scarcely bigger than large dogs, with long manes and tails, and fast little trotting hoofs. They make charming friends and playmates and are often ridden by children or harnessed to tiny pony-carts. The Highland pony, somewhat larger, is the " hill pony " which winds its way among the heather in the wake of the shooting party.

HAVE YOU EVER BEEN CALLED " STUBBORN AS A MULE ? "

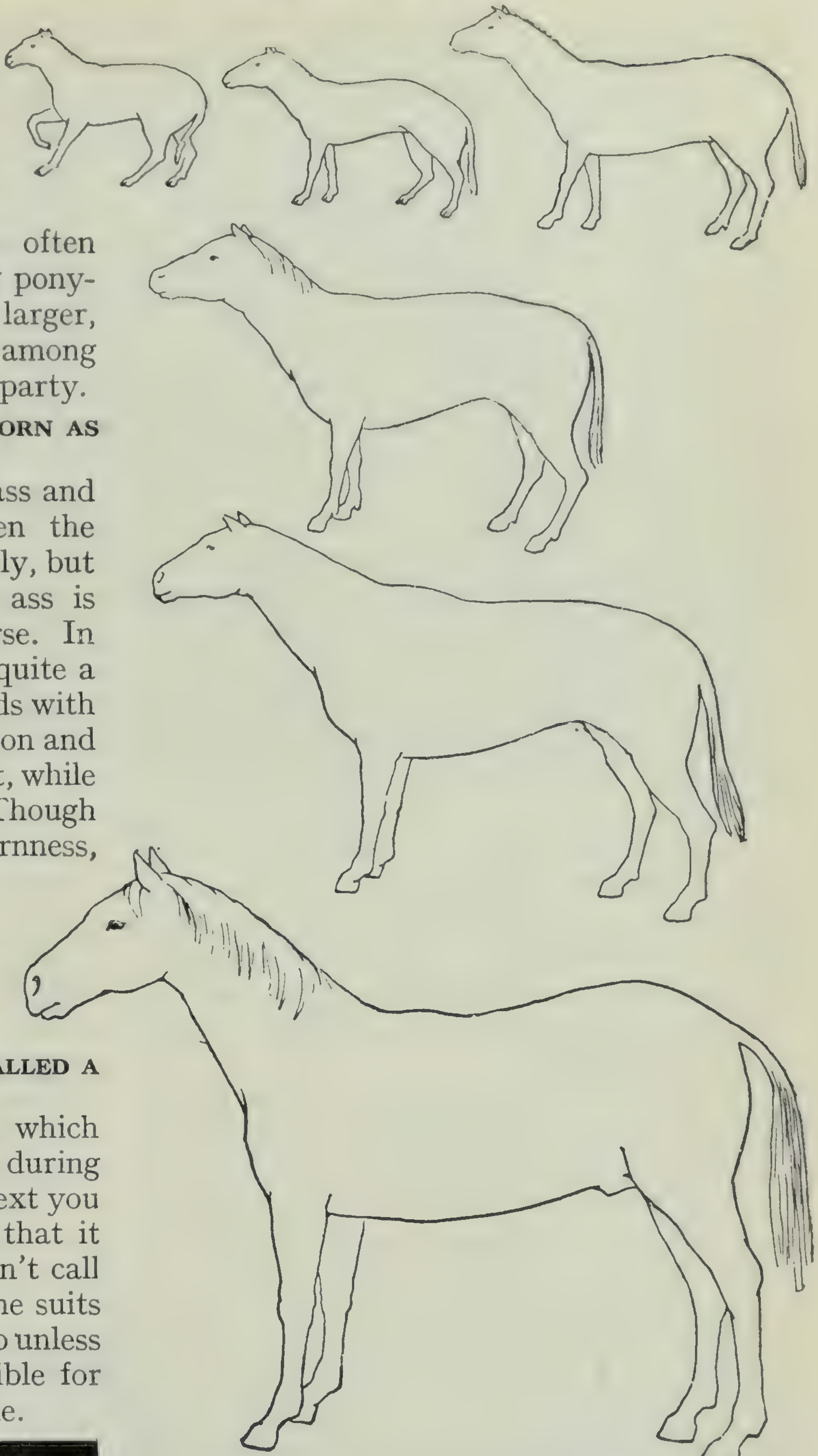
Humble cousins of the horse are the ass and the mule, the latter a cross between the horse and the ass, tall, stubborn, ungainly, but very strong. The appearance of the ass is almost as well known as that of the horse. In spite of his wayward character he is quite a lovable creature, galloping over the sands with a child on his back, grazing on the common and twitching his long ears this way and that, while he utters his loud unmusical note. Though he is a symbol of stupidity and stubbornness, and the lowliest beast of burden, at least one beautiful poem has been written about him (*The Donkey*, by G. K. Chesterton), and you will find him a famous figure in proverb and fable.

DO YOU KNOW WHY THE ZEBRA WAS CALLED A " TIGER-HORSE " ?

" Tiger-Horse " was the name with which a small chap once christened the Zebra during his first visit to the Zoo. And, when next you go to the Zoo you will probably agree that it really is a wonder that everybody doesn't call the Zebra a Tiger-Horse ! For the name suits him so well. All Zebras live in Africa, so unless you turn traveller, it would be impossible for you to see the " Tiger-Horses " at home.



The Donkey is a lowly, yet lovable beast of burden.
[*F. W. Bond*



The evolution of the horse, tracing back the modern animal to its remote ancestor which lived nearly six million years ago.

The Quagga, for instance, is—or was—for these beautiful beasts are supposed now to be extinct—one of the three different kinds of African Zebras. It is a shame, too, that Quaggas should be extinct, for they owe their extinction to their handsome coats and to the greed of the native Boers.

The heads, necks, and shoulders, even the manes of the beautiful Quaggas, were striped with dark-brown rings ; the rest of their graceful bodies were coloured brown ; they lived quiet, inoffensive enough lives, prowling about in herds on the plains of the Orange

Free State. And in Cape Colony they were often seen wandering in search of food, together, in friendly company, with Ostriches and Gnus. Just a quiet friendly party they seemed, and the Quaggas were gentle enough to be tamed sometimes. Indeed, baby Quaggas were sometimes born in captivity. It was when their native captors found out that the Quagga's skin would bring a good price that they began to hunt them mercilessly.

A strong horse could outrun any Quagga, and so the mean sport began. Little by little the herds grew less in number, until in the year 1858 the last Quagga specimen was sent home to England to the Zoo. Poor Quaggas—or "quachas," as the Hottentots called them from the sound of their neighing cry—the story of their extinction is a sad one to read.

CAN YOU TELL THE DIFFERENCE BETWEEN A MOUNTAIN ZEBRA AND A ZEBRA OF THE PLAINS?

After the Quaggas, however, there are left two other Zebra families, which still make their home in Africa, and specimens of each of which can be seen at the Zoo. As it is much more interesting when one is "Zoo-ing," or even looking at animal pictures, to know something about the beasts one is watching, let us learn something of the Zebra families.

There are Zebras of the mountain, and Zebras of the plains.

The Zebra of the plains is often known as Burchell's Zebra, to distinguish it from the "true" Zebra, which makes its home on the high hills. They are different in appearance, these Zebra relations, and as soon as one knows a little about the differences one can recognise a "true" Zebra of the African uplands from Burchell's Zebra of the African plains.

Burchell's Zebra, for instance, has a long flowing tail like a horse; and a shaggier mane than the true Zebra. Its legs are whiter, too, than those of its mountain cousin, whose black ringed markings on a beautiful silver-white coat cover almost every part of its body.

THE WILD ZEBRA DIES OF A BROKEN HEART IF HE IS TAKEN CAPTIVE.

The "true" Zebras, who roam in herds on the African mountains, are, perhaps, the most beautiful of all the family of Tiger-Horses, although, in the opinion of many scholars, these particular Zebras are more like "Tiger-Mules!" The long, full ears and the bare tail of the "true" Zebra, is the reason for that opinion.

The appearance of a herd of these Zebra must be most beautiful; and up on the high, almost inaccessible mountains where many of them spend their whole lives, they must lead a free and glorious existence. They are too far off, and they are too wild, for natives to hunt them to the death for the value of their beautifully marked hides; very seldom has one of them been taken captive, and it is said of these wild and beautiful creatures who love their freedom, that in such case they die of broken heart and spirit.

HOW THE ZEBRA APPOINTS A SENTINEL TO WATCH FOR HIS ENEMY—MAN.

It almost seems as though the dread of capture holds the herd even in their freest moments, for, always—so it is said—up on the highest and wildest parts where man could not go, the Zebra herd appoints sentinels, each in turn, when the herd is feeding, to watch for enemies and to give the alarm. It is quite a relief, when watching the beautiful striped creatures at the Zoo, to know that any Zebra there has been brought across the ocean in early youth. It remembers no other home than the gardens where it grazes, and is probably as happy in its own way as are its brothers of the mountain herd.

How do you like this milkman? In Toulouse, asses are taken round the town and milked before each door, while the customers look on. The milk of asses is nutritious.

Look pleasant, please! The captive lion smiles in a friendly fashion as he poses before the camera. He displays a fine set of sharp teeth, to remind us that he is well armed and will stand no nonsense from anyone.

FOR strength, beauty and ferocity the palm of the jungle goes to the larger *carnivora*, or flesh-eating animals. Chief among these, lords of the forest and the terror of wild nature and of unprotected mankind, are the members of the Cat family, Lion, Tiger, Leopard and the rest. No wonder the wild things are afraid of them. Even the great buffalo is doomed if they mark him for a prey, and how can the gentler antelope, zebra, gazelle hope to escape ?

To the Lion belongs the proud title of "King of the Beasts." For, though he is not more powerful or ferocious than the Tiger, he is in many ways the more kingly beast. He is not so stealthy or so treacherous as the other cats ; and he has a touch of dog-like straightforwardness in his character which helps him to earn his kingly honours.

Arrogant and unconcerned he stalks through the jungle, 500 pounds and more of solid bone and muscle. His magnificent mane, darker than his tawny coat, gives the male Lion an added impressiveness, and when he lifts up his voice his mighty roar is one of the most appalling sounds in nature.

He dwells in the depths of the African jungle, or in Persia ; rarely he is met with in India. Let us watch him as he lies in wait for his prey beside some pool where the animals come to drink. Silently he crouches in the undergrowth ; then singling out a young buffalo or an antelope he hurls the full weight of his 500 pounds on its back, buries his fangs in its neck and crushes its backbone. But, indeed, we cannot quite realise the power and force behind a Lion's spring, or the tremendous "killing-power" of his great teeth and claws. He is besides surprisingly agile, and has even been known to climb trees, though perhaps this is not one of his ordinary accomplishments.

Lions do not always care to attack man, but some are man-eaters by choice, and such we may imagine are a terror to native villages, where the high stockade built to keep them out is not always adequate for its purpose.

> *"Tiger, tiger, burning bright*
> *In the forests of the night."*

Still stronger and more terrible in action, and scarcely less magnificent in appearance, is the Tiger, a native of India and other parts of Asia. His beautiful striped coat blends admirably with the landscape ; his cat-like movements are the perfection of animal grace. We may note, too, that he has many more feline characteristics than old Leo, and that even his countenance is much more like that of the domestic cat.

Though we generally associate Tigers with hot tropical forests, the largest of all are to be found in the snowy latitudes of Manchuria. But the Indian Tiger, too, is a big fellow, and

The Tigrillo moves stealthily from his hiding-place—very different from his younger brother on the hearth-rug.

the natives do well to dread him. Every year he carries off thousands of their cattle, and they themselves fall victim at the rate of many hundreds in the year.

THE MAN-HUNTER WHICH CLIMBS TREES AND DROPS DOWN ON HIS PREY.

"Can the Leopard change his spots ?" we ask sometimes, so you will guess that the Leopard is spotted and not striped like his cousin, the tiger. He, too, may be found in the Indian jungle, as well as in other parts of Asia and in Africa. Like the tiger he is a man-hunter ; and in one way at least he is the more dangerous of the two, since he can climb trees and lie in ambush, ready to drop on the head of the unsuspecting native. A Leopard in captivity is treacherous and dangerous, and not to be depended on even when he seems quite tame.

A beautiful relative of the true Leopard is the Ounce, or Snow-Leopard, who lives in the Himalaya region of Central Asia. High above the snow-line he ranges, clambering with a sure foot among the rocks, and ready to attack any wild creature who comes in his path. He is about four and a half feet long, with a magnificent tail and a lovely long-furred gray coat with darker rosettes.

Akin to the leopard also is the Jaguar of Central and South America, shorter and thicker than his eastern relative, but very active and agile, and not a bit afraid to tackle such big animals as horses and cattle or even man himself. He, too, has a beautiful coat, rosetted with black, and is a famous swimmer and climber.

HOW THE LARGE FAMILY OF BIG CATS FIND THEIR FOOD.

One of the most beautiful of the cats is the Cougar, or Puma, also known as the Mountain Lion. The size of a leopard, the Puma is coloured very much like a true lion, but has no mane, nor is it spotted. It is an inhabitant of both North and South America, keeping to the wild mountainous or forested parts. In some places where it does damage to live stock, the government pays a sum of money to anybody who kills one of these animals.

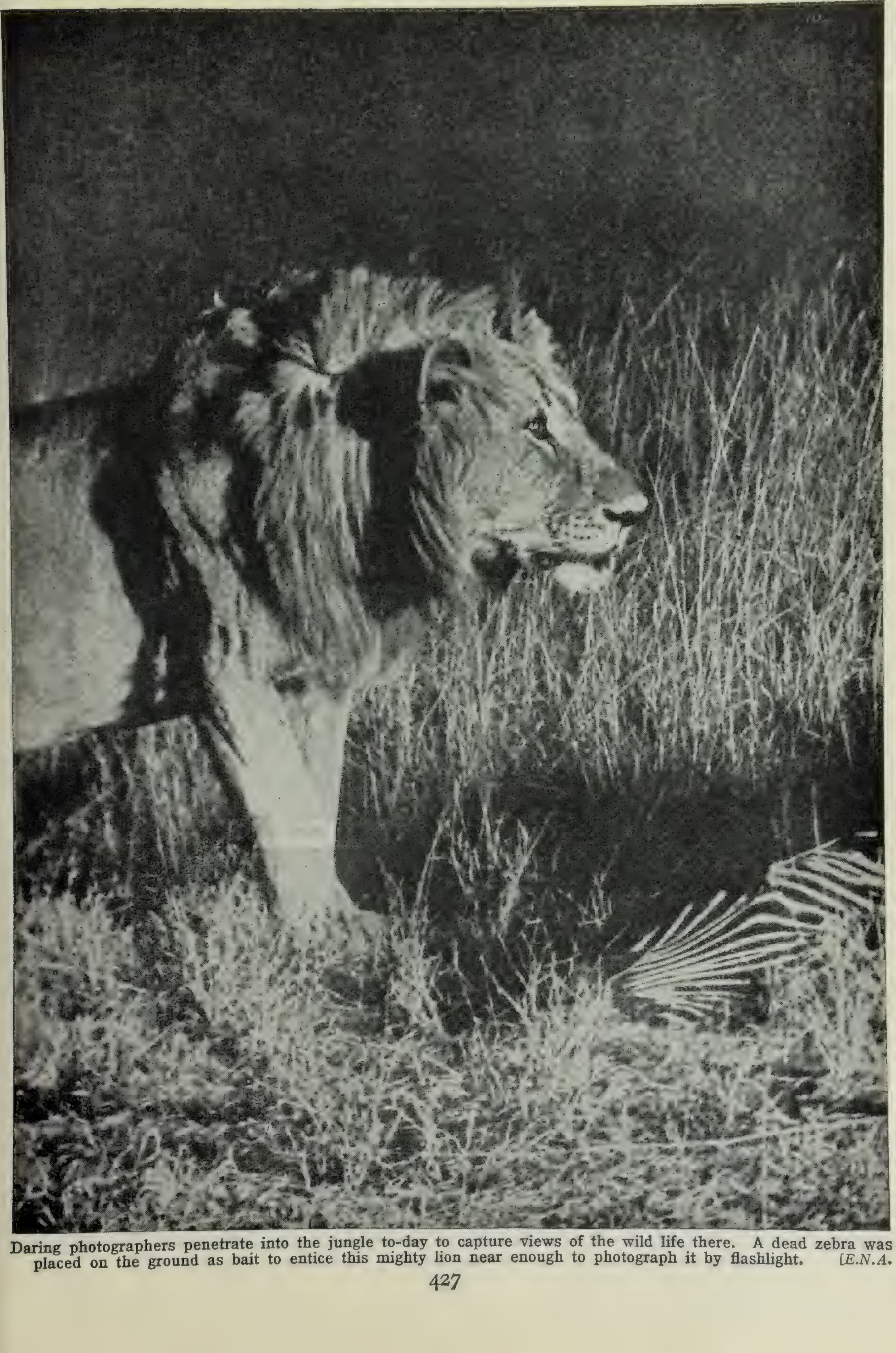
In North America the Puma was sometimes called the "Painter," or Panther, which is the western name for the leopard. He can live through a wide range of climatic and local conditions, and his diet varies from the now almost extinct American Wild Horse to such small fry as game birds, rabbits and mice !

So boldly he attacks the larger animals that one is surprised to find him displaying the utmost timidity with man. No one quite understands why this should be, but it makes him tamable and affectionate. In his youth he is covered with spots and resembles nothing so much as a playful pussy cat.

These by no means exhaust the list of the Big Cats. One has the Lynx, who is credited with extremely sharp sight, the West African Serval, the Cheetah, the Tiger Cat, the Leopard Cat, the Ocelot and many more, not to mention the fierce and untamable Scottish Wild Cat. Can you wonder that Pussy by the fire is so proud and so haughty, now that you know how very distinguished is the family to which she belongs ?

Danger ahead! A remarkable photograph of a tiger emerging from his lair in the jungle on his nightly prowl.

THE KING OF BEASTS CAUGHT BY A CAMERA

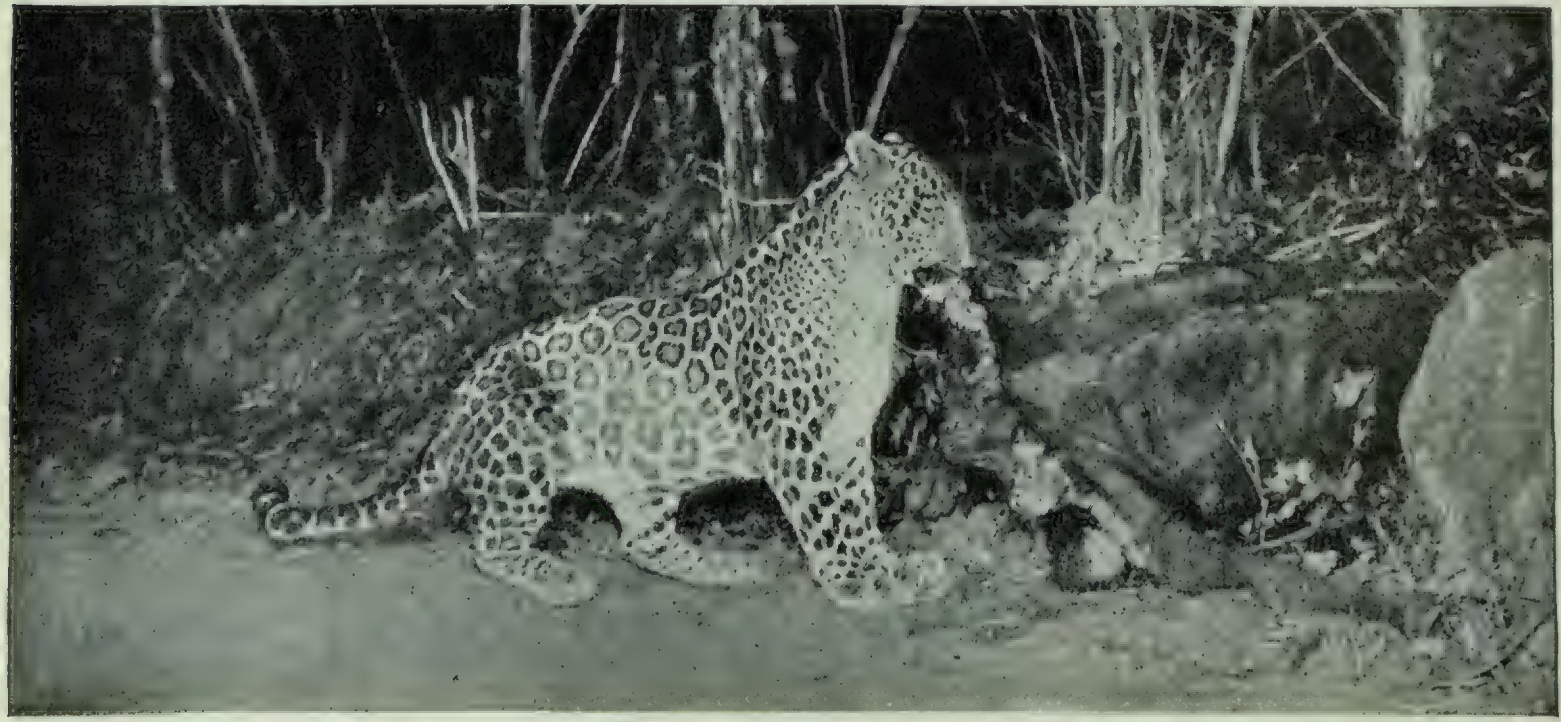


Daring photographers penetrate into the jungle to-day to capture views of the wild life there. A dead zebra was placed on the ground as bait to entice this mighty lion near enough to photograph it by flashlight. [E.N.A.

CHILDREN OF THE JUNGLE ON THE PROWL

A tasty bite! The hungry Lioness, in the heart of the jungle, prepares to make her evening meal off a zebra. [*E.N.A.*

A stealthy Jaguar, on the alert for something to eat, prowls round his domain in Brazil. [*E.N.A.*



Lunch-hour in the jungle! The Leopard enjoys a busy half-hour with his " kill." [*E.N.A.*

THE THICK SKINNED BEASTS

Bath time! A crowd of wild Elephants take to the water and seem to find it great sport to splash about. [*E.N.A.*

ELEPHANT, Rhinoceros, Hippopotamus come to us out of the past, descendants of the mighty Mastodon and his kin, survivals from an earlier epoch when life was lived on a larger and a ruder scale. Though they are not very closely related they have one great feature in common—an exceptionally thick, tough hide. And perhaps it is this very feature which, by protecting them in any country they inhabit, has preserved them from changes through the ages.

Now at last it seems they are dying out. The giants who persisted through the Glacial Period go down to the bullet of the ivory hunter, or escape only to succumb to a chill or a fever. Future generations will regard them as we regard the Hairy Mammoth or the Woolly Rhinoceros—as creatures known to science, but not quite credible to the ordinary mind.

WHAT IS THE LARGEST ANIMAL THAT LIVES ON LAND?

Chief of the Pachyderms (or Thick-skins) is the Elephant, who is also the largest living land animal. He is distinguished by his splendid tusks, long flexible trunk, loose wrinkled hide and tufted tail. Of the two important species—African and Indian—the African is the larger, often standing eleven feet at the shoulder, while his great tusks measure almost as much in length. He has large ears and a rough trunk, and his back slopes from the head downwards, making him seem a rather precarious mount, unless one actually sat on his head. He is a lover of the fresh air and likes to roam through the more open parts of the forest, stopping occasionally to make a rough meal off the branches of the trees.

HOW THE GIANTS OF THE JUNGLE ARE TAMED BY MAN.

The Indian Elephant, native to India, Burma and Siam, is much less robust. He is smaller than the African by about a foot, and his tusks proportionately shorter. His ears also are smaller, his trunk smooth and his back domed in the centre. He is much used in India for hunting and haulage, and as a mount on state occasions. Within recent times attempts have been made to tame the African Elephant also for the service of man.

The only other species is the rare Pygmy Elephant of the Congo, who is only about half the size of the big fellow.

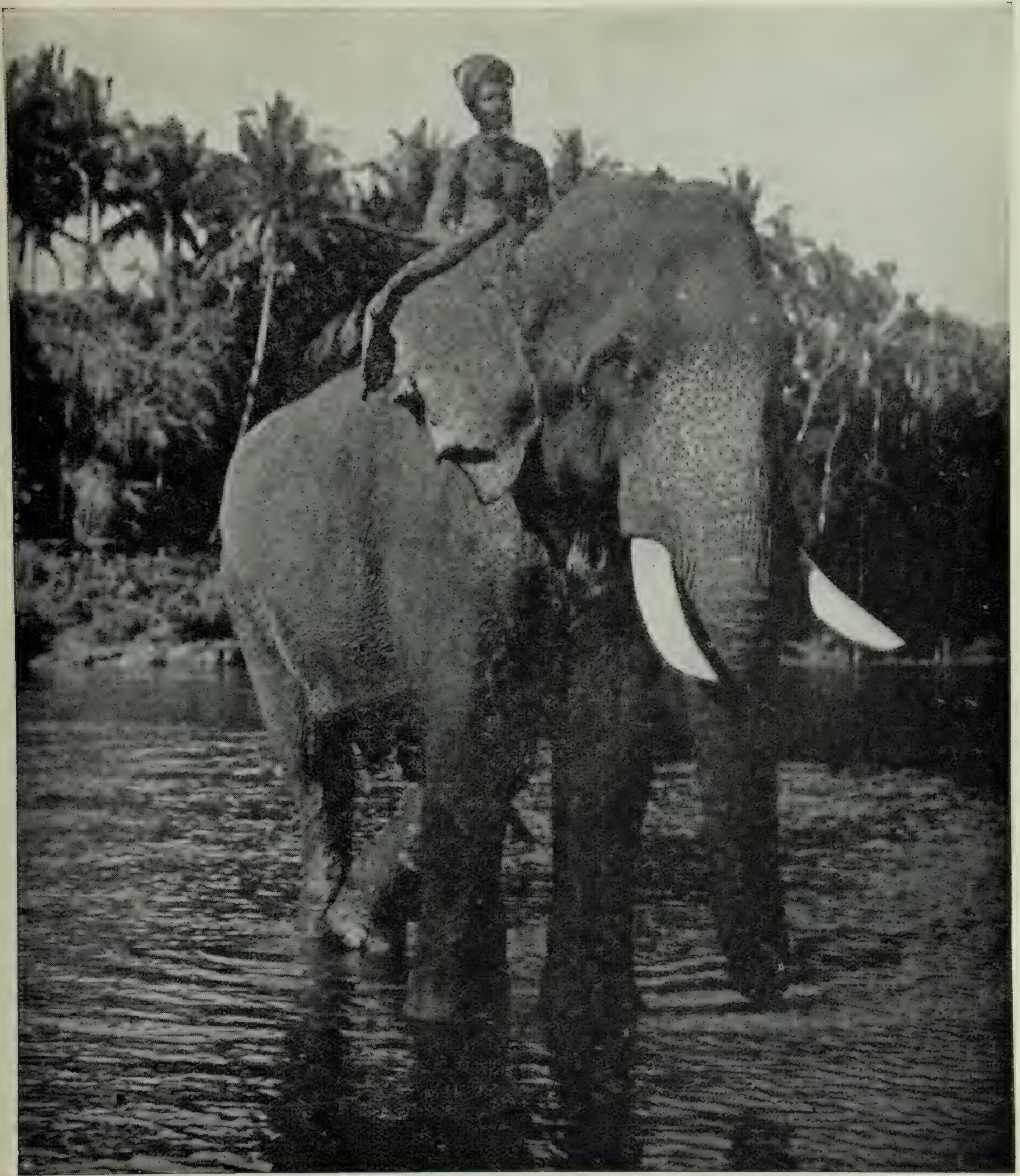
The iron-clad Rhino is another survival from the misty past. He is a large unwieldy animal weighing three or four tons, with a thick, solid, singularly ungraceful body covered with what, in some species, looks like the armour of a Cromwellian soldier. It is merely his tough, strong hide, which hangs in regular folds from his shoulders and flanks, and is almost, if not quite, as effective as plate armour.

Most of us have seen a subdued elephant either in a circus or in the Zoo, but in his native haunts he is not quite so docile. The African elephant is almost untamable and very fierce when enraged, but is valued for his ivory.

His outline is roughly suggestive of the horse, and this, together with his characteristic horn, which rises from the middle of his ugly snout, has led some people to think that he must be the original of the Unicorn of fable and song. Certainly a rough description fits them both ; though we may be sure that the artist who first drew the graceful Unicorn was not the same man who saw the Rhinoceros himself !

The horn of the Rhinoceros is not a true horn, but a sort of hairy outgrowth rising from the skin. Yet it is quite as hard and very thick, and with the great force of the animal behind it is as deadly a weapon as may be found.

Generally speaking the African Rhinos have two horns and the Asiatic only one, though there is a Sumatran Rhinoceros with two horns,



The Elephant strolls into the river to take his bath, with a native to act as valet. The Indian Elephant differs in many ways from his African brother. He has far shorter tusks, smaller ears and a larger head. He is much easier to tame.

the smaller rising just behind the larger. The other Asiatic species are the Indian and the Javan, while the African species comprise the small Black Rhinoceros, weighing only about a ton, and the almost extinct White Rhinoceros, who after the Elephant is the largest land beast in the world.

In temper the Rhino is sulky and aloof. What he lacks in sight he makes up for in sense of smell. When roused his ferocity is frightful and his lumbering charge a nightmare. Luckily he is a vegetarian. One trembles to think what might happen were he to prey on man or beast.

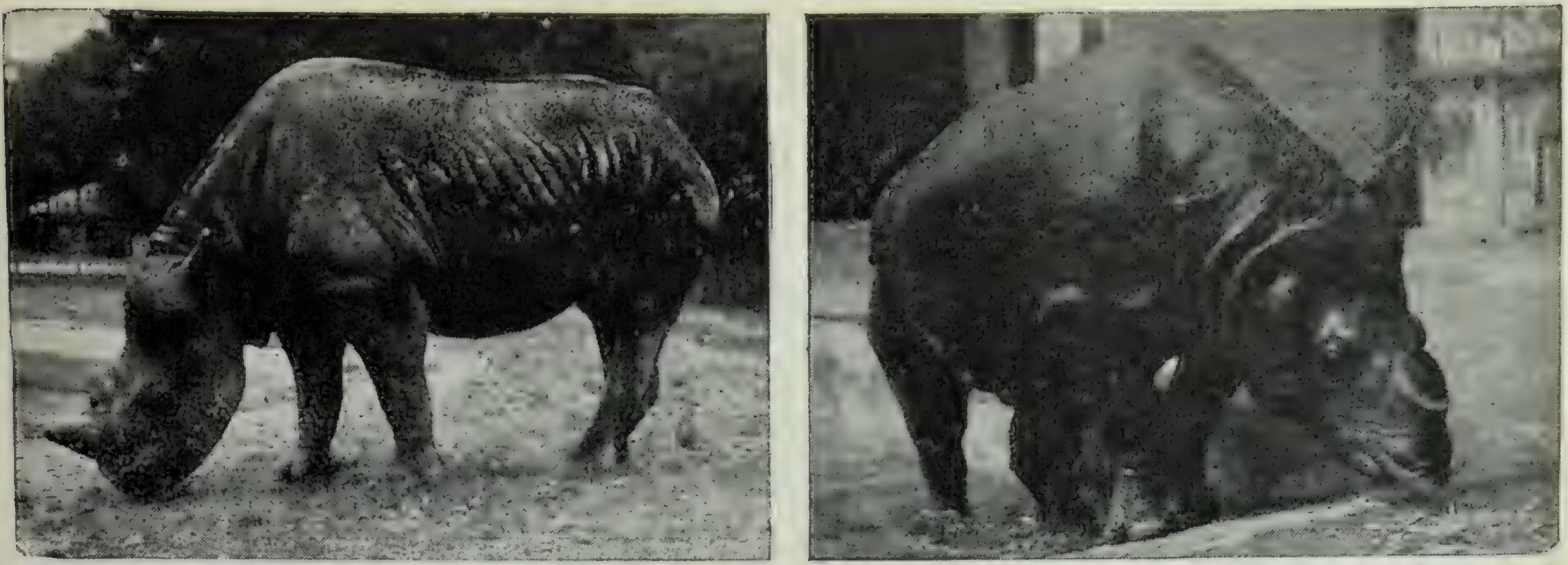
The name Hippopotamus signifies " River Horse." But, strange to say, while the Rhino may have affinities with the horse the " River Horse " has none. He is, in fact, a

Even a baby Elephant can show surprising strength. This youngster, recently captured, is trying to break its bonds.
[*Courtesy Paramount Film Company.*

member of the Pig family. Like the Rhino, however, he is a great ponderous beast up to fifteen feet in length, and weighing three or four tons. His nose is tremendously broad and thick, his mouth a mighty cavern, his teeth enormous. Yet he, too, is a vegetarian feeder and really quite placid in temperament. His great defence is his tough hairless hide, nearly two inches thick in some parts!

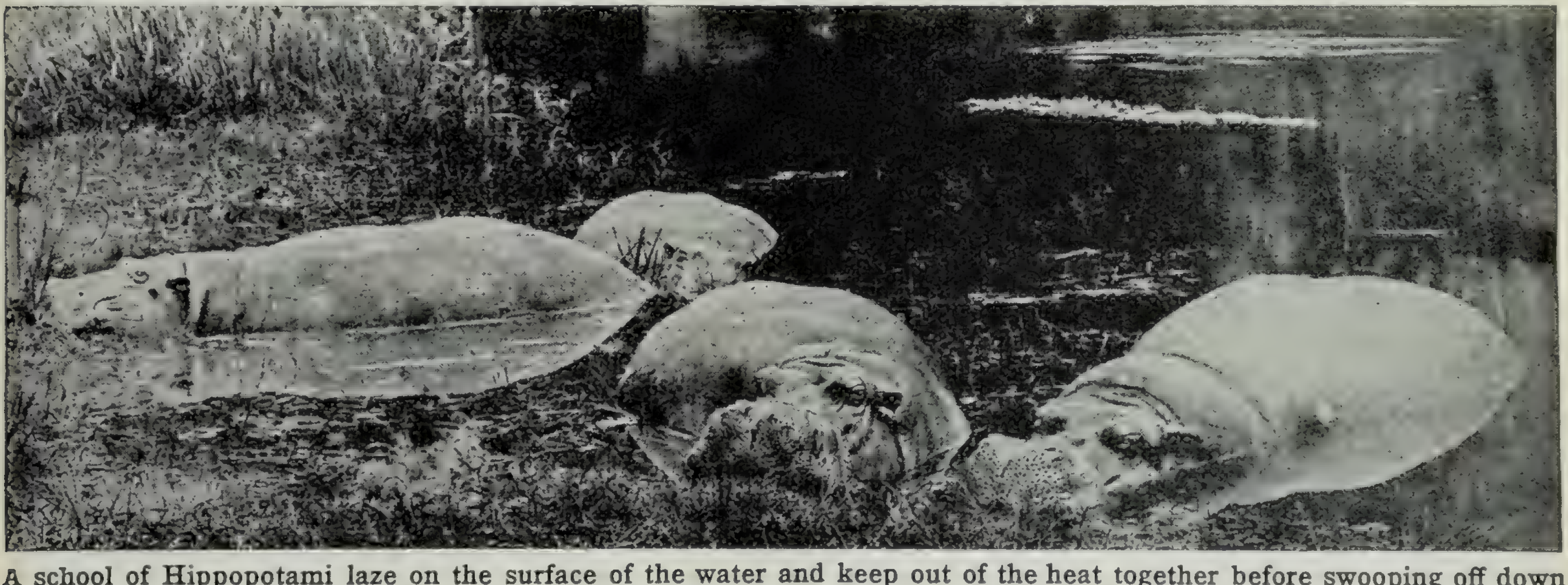
The Hippo haunts the big rivers of Africa, where he dwells among the mud of the river bank. He is a great swimmer, more at home in the water than on land. Watch him as he breasts the sluggish tide. His bulgy eyes and his nostrils make a tiny ripple on the surface. No more is visible of Mr. Hippo! Oddly enough, the baby Hippopotami are not instinctive swimmers, but have to be taught the art by their mothers.

The Tapir is a distant cousin of the Rhinoceros, though to look at his very long nose or short trunk you might rather



The African Rhinoceros on the left is a sulky beast, with a powerful sense of smell. Luckily, this ferocious animal is a vegetarian. The Indian Rhinoceros on the right has a much smoother hide and only one horn. [*F. W. Bond*

At first sight it appears that the Rhinoceros is having his morning swim, but he is only charging through the tall African grass, which grows to a great height. He is not a pleasant fellow to encounter when his temper is roused! [*E.N.A.*



A school of Hippopotami laze on the surface of the water and keep out of the heat together before swooping off down the river in search of food. They are expert swimmers and are more at home in the water than on land. [*E.N.A.*

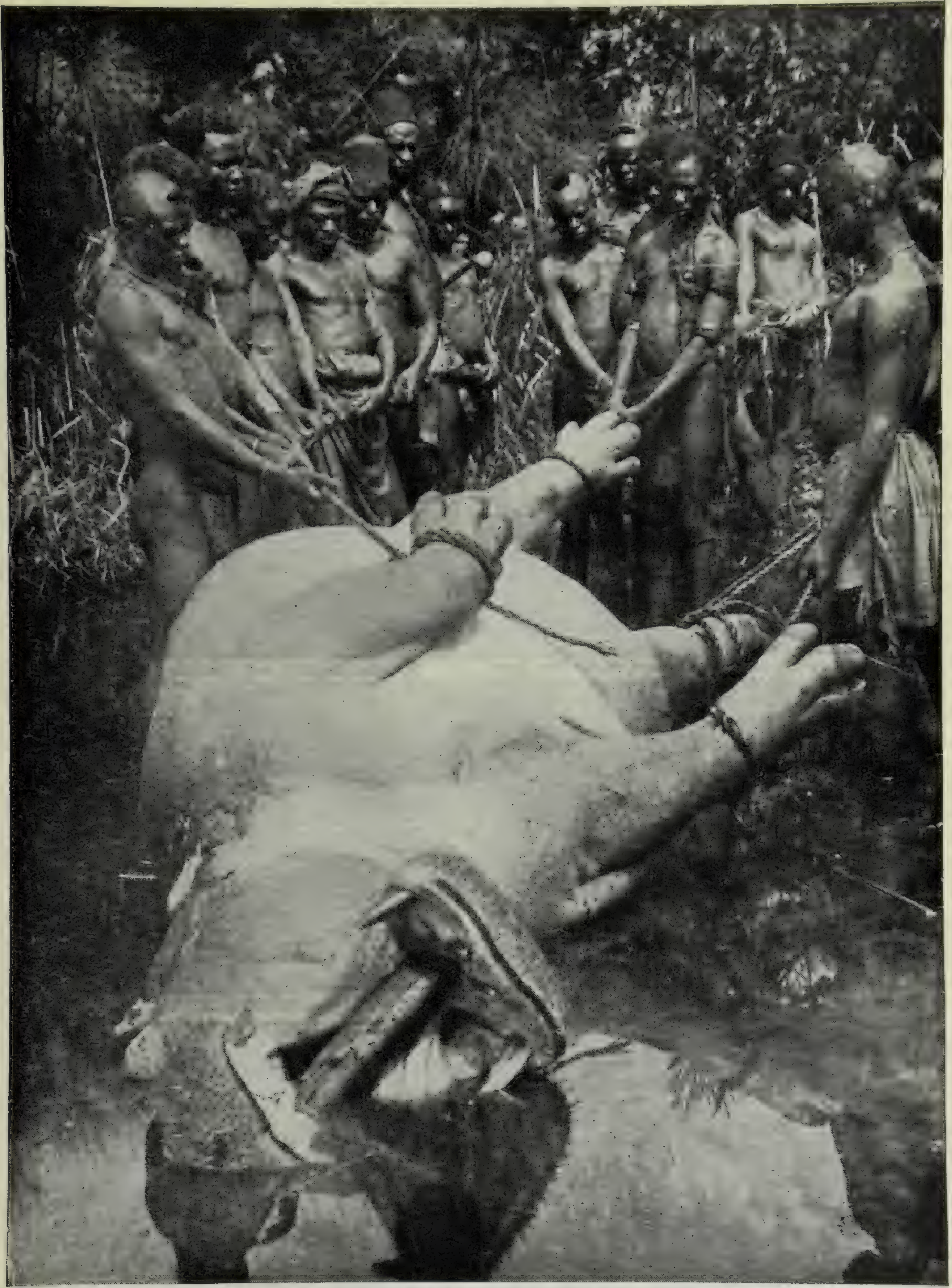
associate him with the Elephant. He is found in Central and South America, and in Malaya, where he is quite eight feet in length and has a whitish body sandwiched between dark fore and hind quarters. The Brazilian Tapir measures about seven feet and is dark-brown in colour. He is a forest dweller like most of his kind, though one species lives high up on the slopes of the Andes in the west.

The young of the Tapir has a spotted coat, or is striped in white and brown. As he grows up, the spots or stripes disappear, and the adult Tapir is either black and white (Malay Tapir), or dark brown or black. On the front feet the Tapir has four toes, and only three on the hind feet. He is very shy, but when roused has a terrible temper and can be very ferocious indeed at times.

THE HIPPO TAKES HIS MORNING BATH

How would you like to meet this giant swimmer at close quarters? The Hippopotamus is very fond of resting in the cool rivers, and is always on the alert for a tasty bite. [E.N.A

HOW A GIANT OF THE JUNGLE IS LAID LOW



The great " River Horse " is not easy to conquer, but the cunning natives have succeeded and seem very pleased with the result. When we see the great mouth, which is propped wide open, we can imagine what a giant the hippopotamus is. The natives find its flesh a great delicacy and use the hide for making various goods.

STUDIES IN EXPRESSION IN THE WILD WORLD

A study in black and white ; the Zebra.

Prejvalsky's Wild Horse from Mongolia.

The Lion shows great intelligence in his fine face.

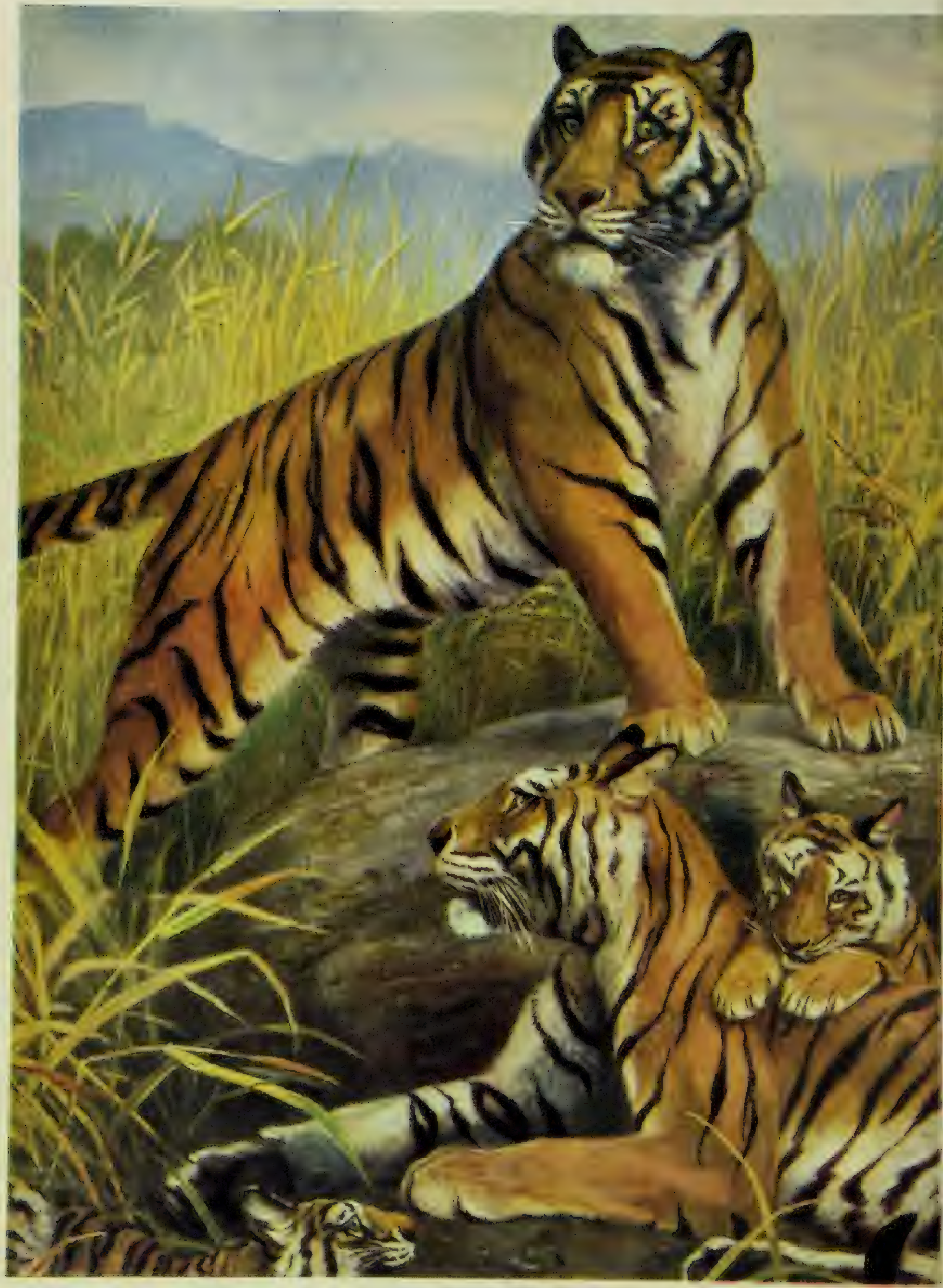
Majesty, cunning and strength ; the Tiger.

There is a wise look in this old Orang Utan's eye.

" Really. I can't believe it," says the Chimp.

It is a large order when Hippo begs a mouthful.

The Vulture is baldheaded, and has a fierce look.



THE TIGER'S LAIR.

There is no wild beast more alert than the tiger. He has all the quick hearing of the cat, and possesses speed, stealth and unbounded courage. In a battle with a lion he is brave and ferocious, and is a good match for the King of Beasts.

Facing page 437

BEARS AND THEIR COUSINS

A Polar Bear, after it has been lassoed by hunters, poses for the camera in its ice-bound home. [*E.N.A.*

IF the lions and tigers are among the most graceful of the animals, what shall we say of the Bear? A great shaggy creature of enormous strength and weight and incredible awkwardness, he shambles over the snow-field or through the forest, walking on the outside of his paws and covering the ground with considerable speed. From time to time he rears himself erect on his short hind legs, growls and gnashes his teeth. Woe to the man or animal who crosses his path when he is hungry. A blow from the mighty paw, a bite from the cruel teeth, and the prey is his.

Bears are to be found in many parts of the world, mainly in cold and temperate regions, but a few species as far south as Malay and India. They will eat almost anything, from roots, fruits, insects, to horses and buffaloes. Several of the larger species are man-eaters also. Curiously enough, their favourite article of diet is honey, and nearly all Bears share this taste.

Bruin at the Zoo is sometimes tame enough to eat out of our hands, but we must remember that he is cunning and treacherous, and by no means always to be trusted.

THE BEAR HAS RELATIONS IN MANY PARTS OF THE WORLD.

Most widespread of all is the Brown Bear, ranging over wide areas in Europe, Asia and America. Formerly his ancestor roamed in Britain also, and had his den, and carried out his stealthy raids, where now all is peace and security. Perhaps the very useful date 1066 may help us to keep him in mind; for while he was known to exist in England about that time, before the end of the eleventh century he had quite died out. Now he ranges through Norway and Sweden, Russia and Germany, as far east as Japan and as far south as the Pyrenees, Malay and Borneo, while in America there is the huge Alaskan Brown Bear, second only to the Polar Bear in size and ferocity. In captivity the Brown Bear can usually be taught to behave nicely, though his temper is so uncertain that it is wiser not to go too near his cage.

THE HUNGRY POLAR BEAR COMES TO DINNER WITH A GOOD APPETITE.

Much the most handsome as well as the largest species is the Polar Bear, who lives, as his name indicates, in the ice-bound Arctic regions around the Pole. He will bear comparison even with the tiger. His slow and massive movements have a beauty of their own, while his thick snow-white coat shows to advantage as he propels himself over a blue ice floe, or sits basking in the rays of the Arctic sun. For his dinner he has seal or walrus, or occasionally part of a whale cast up by the chilly waters; but he also eats fish and anything else he can find. Few creatures of the Arctic can resist his great strength, the blow of his bristled foot or the clutch of his steely jaw. He is indeed " monarch of all he surveys."

Unlike the other Bears in northern latitudes, the Polar Bear does not sleep through the

BIG BEARS AND BABY BEARS POSE FOR US

A Black Bear and her two cubs have a little frolic near the tree top, and seem to enjoy the fun. [*E.N.A.*

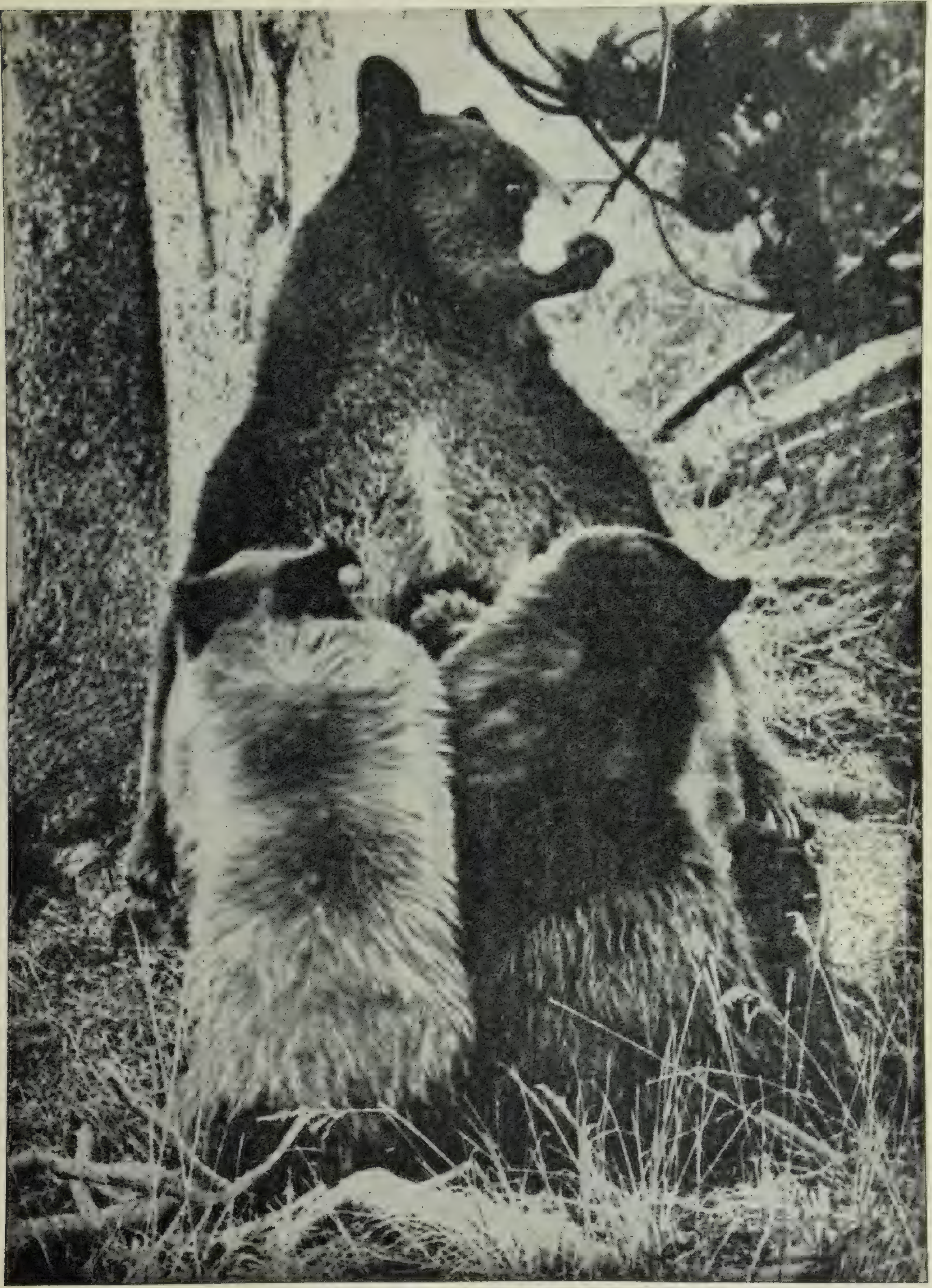
The Siberian Bear in its wild home shows that it is quite easy to balance on its hind legs. [*E.N.A.*

The huge Grizzly Bear of the Rockies, which is twice as heavy as a lion, is rarely seen to-day. [*F. W. Bond*

The monarch of the Arctic—the snow-white Polar Bear. In captivity this animal is generally docile. [*W. F. Taylor*

The Black Bear is not particular about his diet. He eats anything, from roots to buffaloes. [*W. F. Taylor*

THE THREE BEARS STOP FOR A MEAL



A wild Black Bear stops her gambols in the forest to feed her hungry twin babies. These large monsters of the wood are very heavy, lumbering creatures. They are quite friendly in captivity but apt to be treacherous. *[E.N.A.*

The Sloth Bear of India is a very untidy-looking animal, with long hair and exceedingly sharp claws. His long, protruding muzzle looks much like a snout. [*F. W. Bond*

winter, but prowls about in search of food. His mate digs herself a cavern in the snow and there she brings forth her cubs, snow-white like herself, and nourishes them through the winter. Luckily, the little cubs also have thick fur overcoats to keep them warm in their winter quarters.

THE FORMIDABLE MONSTER THAT IS TWICE AS HEAVY AS A LION.

Who has not heard tales of the monster Grizzly of the Rockies? Common as he once was, he is now very rarely to be seen, though you may still meet with him in the great National Parks of America. He certainly added considerably to the dangers and excitements of the hunter's life—a huge creature, twice as heavy as a lion and fully as strong and formidable. Another kind of Grizzly found in Canada is smaller and less horrific—though still something of a proposition!

Of the Black Bears, as of the Brown, there are several different kinds. The Himalayan Black Bear, distinguished by a white patch on his chest, is a flesh-eater, while his cousin, the American Black Bear, wanders harmlessly through the woods eating fruits and berries. The Spectacled Bear of the Andes is also black, though he is not properly classed as a Black Bear. Big " spectacle " rings round his eyes give him his name, and, incidentally, a very curious appearance.

The " Ring-tailed Coon," or Raccoon, is a clever little tree-climber. He is one of the smaller cousins of the Bear family. He has very fine fur and a ringed tail. [*F. W. Bond*

DID YOU KNOW THAT SOME BEARS ARE VERY FOND OF HONEY?

Both the Sloth Bear (India) and the Bruang or Malay Bear are especially fond of honey; the former, indeed, is sometimes called the Honey Bear. He has a very long-haired coat and loves to poke his snout into the high-built cities of the termite ants, and eat up the little creatures for his dinner.

Now we come to the smaller cousins of the great Bear. Perhaps his nearest relative is the Panda, a little reddish-brown furry animal, not much bigger than a cat, which lives in China and Tibet. Next to him comes the familiar " Ring-tailed Coon," the Raccoon, a handsome little tree-climbing creature with fine fur and a ringed tail. Others are the charming little Kinkajou, easily tamed and sociable; the Mink and Sable, known for their beautiful and valuable fur; the malodorous Skunk and the greedy Wolverine, or Glutton, who is larger and will eat up everything in his path. Would you guess that that shy old recluse, the Badger, belonged to the Bear family? The kinship exists, though perhaps the Bear would be too proud, and the Badger too independent, to own it.

The greedy Wolverine, or Glutton, has a tremendous appetite and is always ready for a meal of anything he can find. He is another member of the Bear family.

He is a very harmless and inoffensive fellow but can fight fiercely when attacked. He lives in the woods and among the hills, and spends a great part of the winter snoozing.

THE FLEET-FOOTED ANIMALS

A herd of Elk running races to test their speed. Their great branched horns make a pretty picture.

WILD nature is nearly always at war. The larger Carnivora prey upon the less, and together they track down the harmless grass-eaters, who are thus compelled to fight for security of their lives. Many are armed with tooth and claw, with trampling hoof and rending horn. The Rhino, besides being armed, is a fortification in himself ! Yet not all the beasts are so thoroughly equipped. Those who cannot fight must run away, and thus it comes about that some of the loveliest and most innocent of the creatures are also the fleetest of foot.

Let us look first at the great Antelope family whose members, Hartebeest and Eland and Gnu and ever so many more, wander through the African and Asian wilds in ever-diminishing numbers. After the Antelope come the Deer, and after these such isolated species as the Ibex, swiftest of the Mountain Goats, and the Chamois, who is about midway between the Goat and the Antelope.

THE QUEER CREATURE THAT IS A MIXTURE OF HORSE, ANTELOPE AND BUFFALO.

The Gnu or Black Wildebeest (to give him his picturesque African name) is a very imposing member of the Antelope tribe. Striking rather than handsome, he reminds us of a well-known parlour game, for his various parts, his head and horns of a Buffalo, mane and tail of a Horse, legs of an Antelope, seem each to have been designed without reference to the others. His behaviour in face of danger is no more consistent. You never can tell whether he will plunge and caper like the Horse, charge like the Buffalo or run like the Antelope. Possibly he will do all three !

This species is also known as the White-tailed Gnu, and is native to Cape Colony and the Orange State. The Brindled Gnu, or Blue Wildebeest, is another variety ranging north of the Zambezi through tropical East Africa.

SOME SPEEDY CREATURES OF THE ANTELOPE FAMILY.

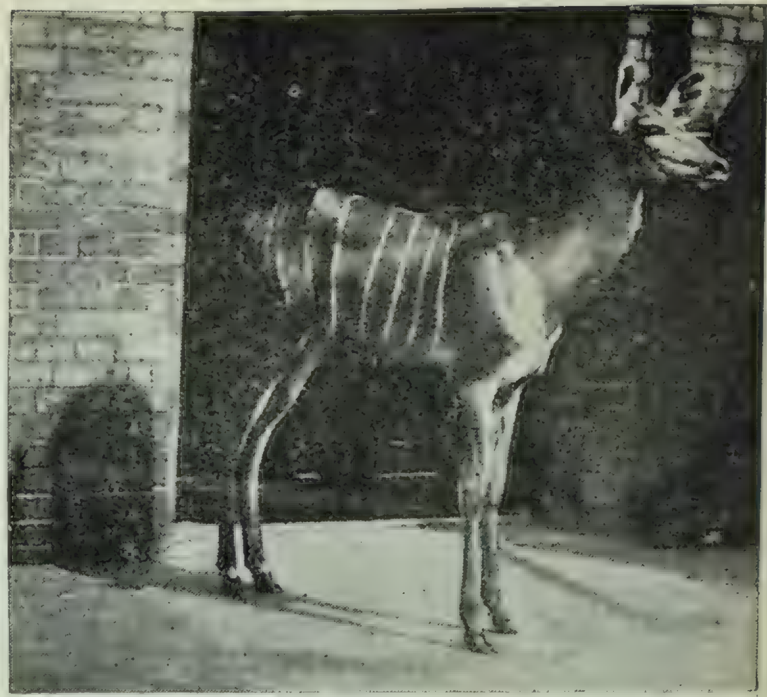
Another big South African is the Eland, one of the largest of the Antelopes. He has straight, spiral horns and a handsome light-buff, coat which in some species is delicately striped with white. His close cousins include the Greater and Lesser Kudus, the Roan and Sable Antelopes, the tall slate-gray Nyala of East Africa, the Bushbuck or Harnessed Antelope, so-called from the markings on his chestnut coat, and the Bongo of the West African forest region, who also has a beautiful white-striped and white-chevroned coat. All of these creatures have the most marvellous turn for speed.

The Hartebeest is a little like the Gnu in some ways, though he is more of an Antelope and less of a natural freak. He, too, has the Giraffe-like droop from shoulder to tail which characterises the Brindled Gnu, but, unlike the Gnu, he has no tufts of hair on his face and no mane, though he has a fairly long tail. Also, his horns are not buffalo-shaped, but lyrate, which means that the two together make the outline of the old musical instrument called the lyre—a very graceful shape. At one time great numbers of Hartebeest roamed the South African plains, but like their cousins, the Bontebok and the Blesbok, they are now very rare and seldom to be seen wild.

The true Antelope, or Blackbuck, the Springbuck and the Gazelles are closely connected. The first, which gives its name to the whole family, is a native of India and has very long spiral horns, worn by the male only. The Gazelles, horned in both sexes, are exquisitely shy but gentle and amiable creatures, and their name is proverbially associated with lightness and grace. There are numerous species, widely scattered over North and East Africa and parts of Asia. The Springbuck of South Africa also is a kind of Gazelle.

The Royal Stag, with his majestic bearing, is a hillside creature. He sheds his long, graceful antlers every year. [E.N A.

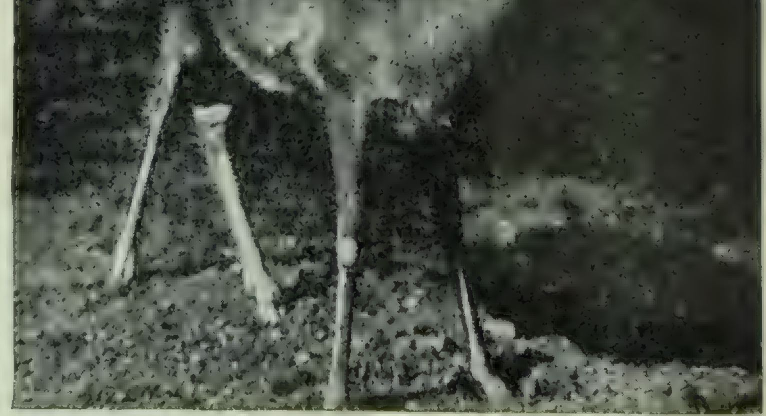
Eastern cousins of the Eland and the Bushbucks are the Nilgai (the English translation of his name is " Blue Bull ") and the Four-horned Antelope. The Nilgai is the largest of Indian Antelopes—quite gigantic in size. As his name indicates, he is bluish-gray in colour, and his horns are short and straight. The Four-horned Antelope is the only member of the family thus doubly equipped.



Another speedy animal is the Greater Kudu—a close relation of the Eland. His striped coat gives him a smart appearance. [F. W. Bond

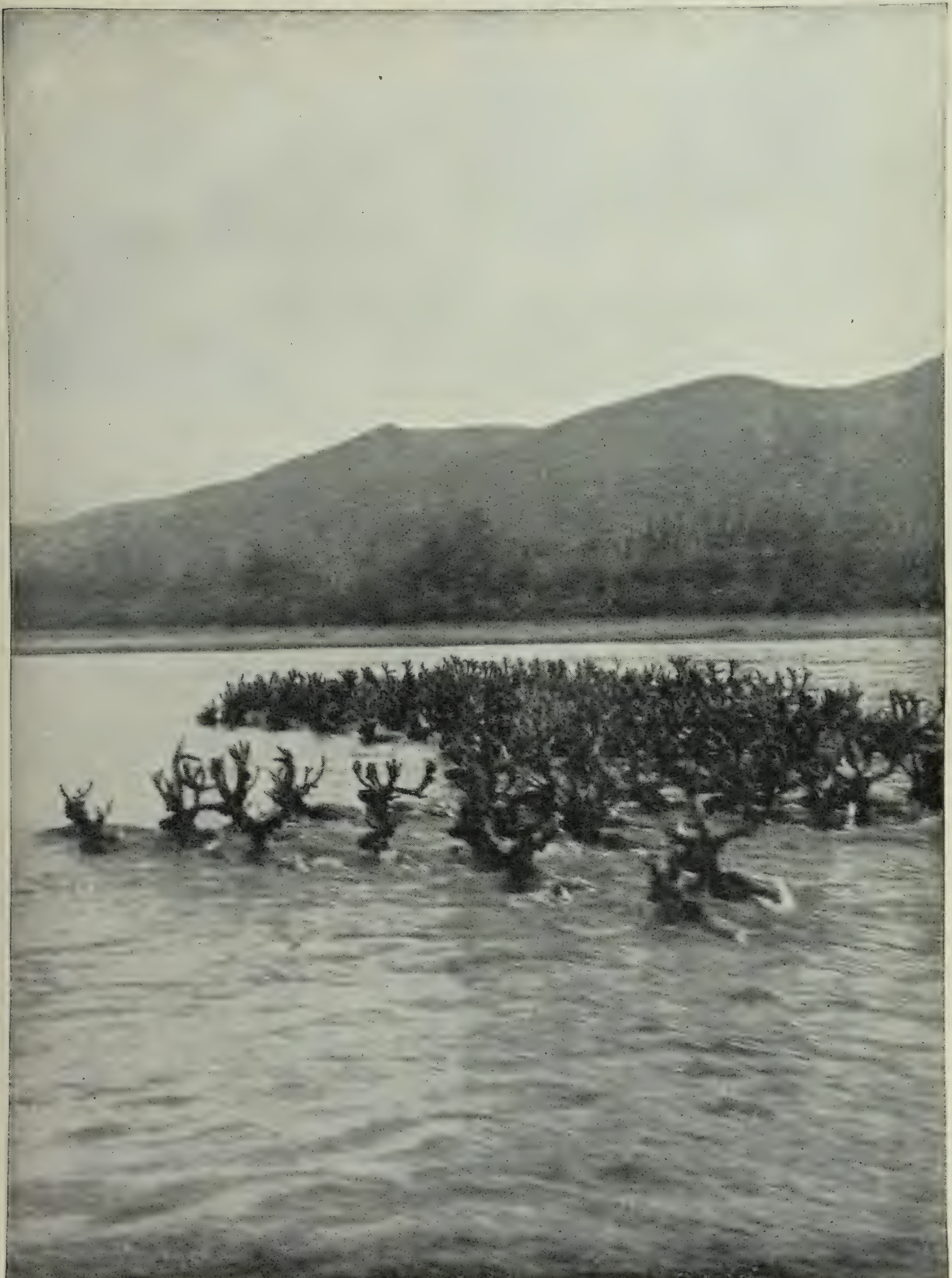
Curiosities of the Antelope world are the Saiga of the Kirghiz Steppes and the Chiru of Tibet, both of whom have very large, inflated noses and slim, ridged horns.

No we come to the Duiker branch of the family—the Bush Duiker with its backward-slanting horns, the Forest Duiker and the Blue Duiker. These are all rather small and the Blue Duiker quite tiny. Other



The Springbok or Springbuck of South Africa, another of the Antelope tribe, is a light and graceful creature with short lyre-shaped horns. [Will F. Taylor

CARIBOU HOLD A SWIMMING MATCH



A wonderful picture showing hundreds of Caribou swimming the Yukon River. The Caribou, with its magnificent antlers, is a variety of Reindeer and is found in Canada and Greenland. It is sometimes known as the American Reindeer. Unlike the Reindeer, however, it has never been domesticated, but prefers to roam wild with its tribe.

The solemn creature with the beard is the White-Tailed Gnu—a member of the large Antelope family. [*F. W. Bond*

In Lapland the Reindeer is a domesticated animal, and large herds are kept for their milk, flesh, and hides. [*E.N.A.*

species are the East African Sunis and the Pygmy Antelope of West and Central Africa, scarcely over a foot in height, and the Royal Antelope of West African coastal regions, who only measures about ten inches. The Dik-dik is another tiny species, with a tufted crest and long, trunk-like nose.

THE FLEET-FOOTED ANIMAL THAT LOVES TO SCALE HIGH MOUNTAINS.

More familiar to most Britons are the fleet-footed Deer. Some species of the widespread Red Deer we have in our own country, and most people have seen a Royal Stag with his great velvet-covered antlers, which he sheds every year. The Reindeer are dwellers in the frozen north, where they are widely domesticated by the Lapps, Norwegians and other Europeans, as well as in Siberia and Alaska. In America the wild Reindeer is called Caribou, and is hunted along with his relative, the Elk or Moose. Both are great clumsy beasts, but very swift travellers over the frozen snow.

The Chital or Spotted Deer of India is a handsome creature, with his beautiful white-spotted coat and his slender, delicate antlers which may exceed a yard in length.

In addition to the Deer one has in Europe the Ibex and the Chamois, fleet of foot and agile to a degree. The Chamois, quite as much goat as antelope, bounds among the Alpine rocks in places where surely no other animal could find a foothold—helped by the peculiar shape of his little hoof. He stands about two and a half feet high, and is so little concerned about the cold that he follows the snow-line all the year round.

Another active European is the magnificently horned Ibex or Steinbok, a species of wild goat ranging from the Alps eastwards to the Himalayas. He, too, is a lover of the heights, and scorns to descend below the snow-line. Unfortunately, he is now very rare in Europe.

THE QUEER PRONGBOK, THAT IS A MIXTURE OF ANTELOPE, OX AND DEER.

America, also, has her share of fleet-footed animals. Besides the Elk and the Caribou there is the Prongbok, called locally an Antelope, though really he is somewhere between an Ox and a Deer. The Prongbok has straight black horns and a sandy coat, and ranges over the plains of the north-west. Another American fleet-footed animal is the Rocky Mountain Goat, who, like the Chamois, is quite as much antelope as goat. He has a white coat of long hair and a pair of black, backward-curving horns.

The wistful-looking Chamois is one of the tribe of Mountain Goats. He is sure-footed and a clever jumper. [*F.W. Bond*

THE MONKEY TRIBE

Sixty words a minute! A chimpanzee takes his place on the New York Zoo's clerical staff. He looks very competent and businesslike, doesn't he ? It is easy to train these clever animals to perform many amusing tricks.

MONKEYS in some ways are exceptionally interesting beings. They have odd little human ways and mannerisms, and it is just this which claims our attention. For if the zebra be the cousin of the horse, and the cheetah the cousin of the tiger, the Ape, chief of the Monkey tribe, is in a sense *our* cousin, and so entitled to some of our interest and friendship. Structurally the Apes are very similar to man, though often they are so grotesque in appearance that they seem like hideous caricatures of the human race.

Their intelligence, while it ranks high among the animals, is yet far below that of the most primitive savage. There is indeed a wide gap ; and though for years scientists have looked for a " missing link," a real Ape-man to bridge the gap, they have never succeeded in finding one.

THE MAN-LIKE APE IS THE MOST HUMAN OF ALL ANIMALS.

The Anthropoid (or man-like) Apes are, after man himself, the highest branch of the great Primate order, so-called because it is the first, or highest, order of the animals. There are four different species of Anthropoids, the Gorilla, Chimpanzee, Orang-Utan and Gibbon. The first three are classed as the Great Anthropoids, and the Gibbons as the Small Anthropoids.

After the Apes come the Monkeys proper, and after these, lowest in the scale of the Primates, such little forest creatures as the Lemur, the Tree-shrew and the African " Bush Baby."

THE GIANT GORILLA IS VERY FIERCE WHEN ON THE WARPATH.

Largest and most fearsome of the Apes is the giant Gorilla, whose home is in the forests of Equatorial Africa. He is known by his great size and massive proportions ; his black face and dark hairy coat ; his long nose with thick round nostrils, great jutting brows and small ears. His head, too, is small, rising on the top in a sort of muscular crest or top-knot. His neck is immensely thick and his vast hairy chest tremendously broad and deep.

You remember how, in *The Gorilla Hunters*, the young hunters were startled to hear a deep drumming noise mingling with the roars of the Gorilla. This very terrifying sound characteristic of the Gorilla on the war-path, is caused by the great beast drumming with his " fists " on his mighty chest. Ordinarily, he uses all four feet to walk on.

At night the Gorillas go to bed on rough platforms which they build among the trees.

The mountain Gorilla is a savage member of the Ape tribe. Sometimes young ones are captured and are tamed, but they seldom live long in captivity. [*E.N.A.*

Only the old patriarch, leader of each family group, acquires so vast a bulk of muscle and sinew that he cannot climb, so he makes his bed low on the ground, while his family encamp in the neighbouring trees. He is their lord and protector, a frightful and ferocious foe when aroused, though not usually the attacker. One may imagine that his hoarse cries and the sight of his terrible fangs would warn most animals not to seek a quarrel!

HOW THE ORANG SWINGS HIMSELF TO THE TREE-TOPS.

The Chimpanzee, who also lives in the forests of Central Africa, covers a much wider area. Temperamentally, he is as different as possible from the Gorilla; a friendly and sociable animal, fond of his own kind and gentle and playful in captivity. He is smaller than the Gorilla, has a much pleasanter countenance and habitually stands upright. Like the younger Gorillas, however, the Chimpanzees climb trees and build "nests," rough and rude platforms hastily put together.

"Man of the Woods" is the Malay name for the Great Anthropoid of the East Indies—the Orang-Utan. He, too, is a tree-climbing animal, with all his faculties adapted to his life among the branches. He has very long arms, and his hands are cupped to enable him to grip the overhead branches. When he builds his house in the Bornean jungle he takes greater pains with it than the easy-going "Chimp."

The Orang is not nearly so heavy as the Gorilla, for though he stands over four feet in height he weighs only from ten to fourteen stone, while the Gorilla, who is about six feet high, sometimes weighs thirty stone.

Of all the man-apes the Orang is the least like man; and yet he has his human moments, too, of sadness or homesickness, and then he is a pathetic figure indeed.

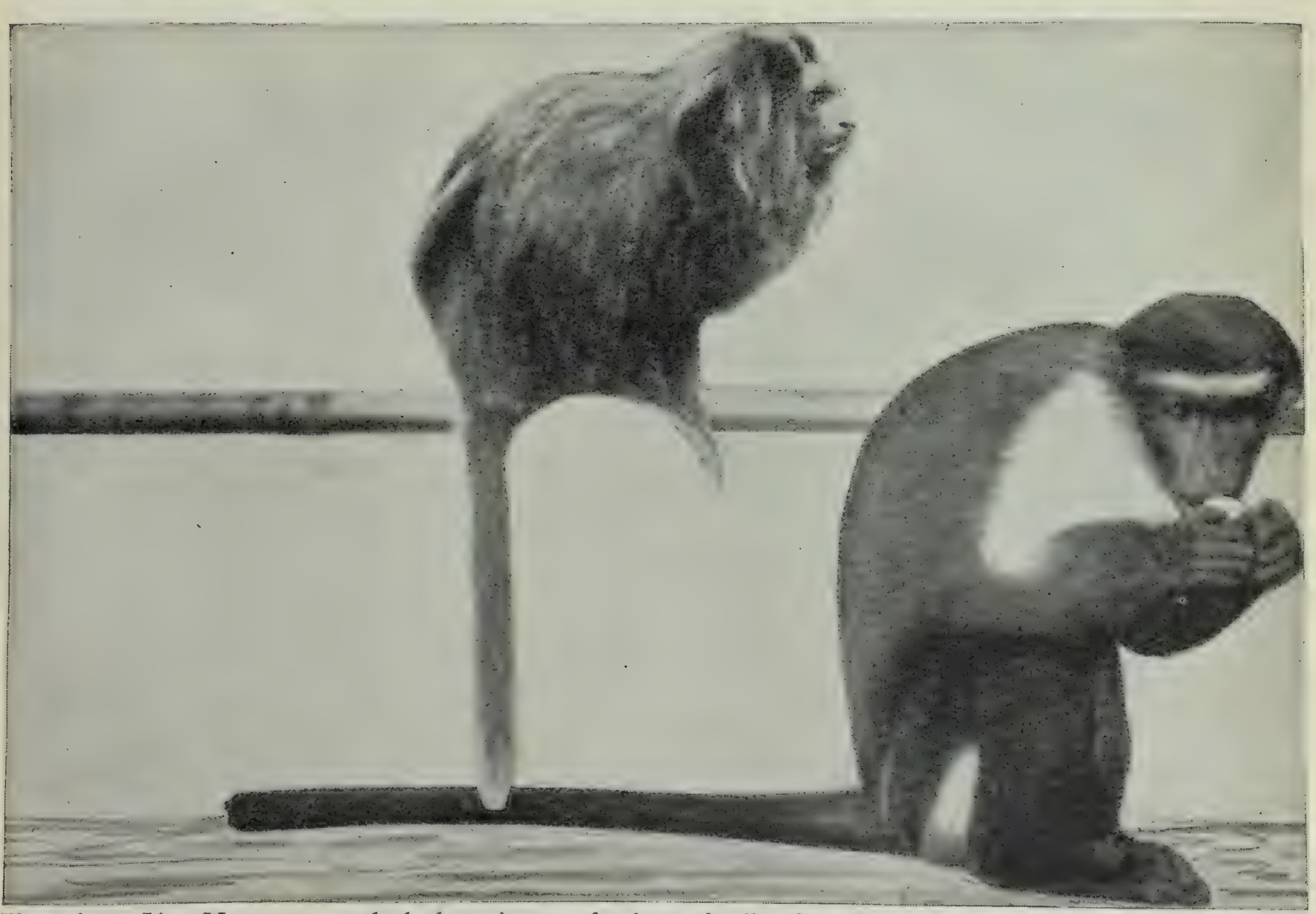
SOME QUEER CREATURES THAT SPEND THEIR TIME IN THE TREES.

The Gibbons form the group known as the Small Anthropoids. The largest of the species, the black Siamang, is no more than three feet high and weighs only from fourteen to twenty-eight pounds. This may seem rather a light weight for his size until you understand his structure. He is long and slim, with spidery, far-reaching arms and legs, and a luxurious long-haired coat. His favourite mode of pro-

A young Gorilla in captivity is seen holding on to the bars of his cage. *F. W. Bond*

QUEER MEMBERS OF THE MONKEY TRIBE

Which one would you like for a pet? They are all full of clever pranks, and keep onlookers amused watching their antics. The Diana Monkey on the left wears a white waistcoat, which gives him a comical appearance. The Woolly Monkey on the right looks more like a toy than an animal. He is very fond of doing acrobatic feats.



The solemn Lion Marmoset perched above is one of a large family of small monkeys, found only in Central and South America. He resembles the Squirrel in appearance, with his bushy tail and thick fur. He is an expert tree-climber and lives mainly on insects and fruit. The Diana Monkey on his right is very intent on his meal.

STUDIES IN EXPRESSION IN MONKEY-LAND

We all enjoy watching the monkeys at the Zoo as they perform their antics. They are full of mischievous pranks and almost human in their attitudes. In their wild state the Brown Capuchin monkeys, seen above, live in the tree-tops.

What do you think of this goggle-eyed animal? It is the Slender Loris, one of a family of small lemurs found in tropical Asia. It is a nocturnal creature, and moves with great slowness and stealth. [*F. W. Bond* gression is to walk along the branches in an upright position, with a grip on the branches above him.

Though at a glance he is by no means manlike, yet he is tailless like the other Anthropoid Apes, and scientists find his bony structure and the arrangement of his organs very like those of the human frame. He is generally black, gray or camel-colour. The Silvery Gibbon has an especially beautiful coat. He is very graceful and good humoured, and like the rest of his kind lives among the high trees.

THE BLACK AND RED "HOWLERS" ARE AMONG THE CURIOSITIES OF THE MONKEY TRIBE.

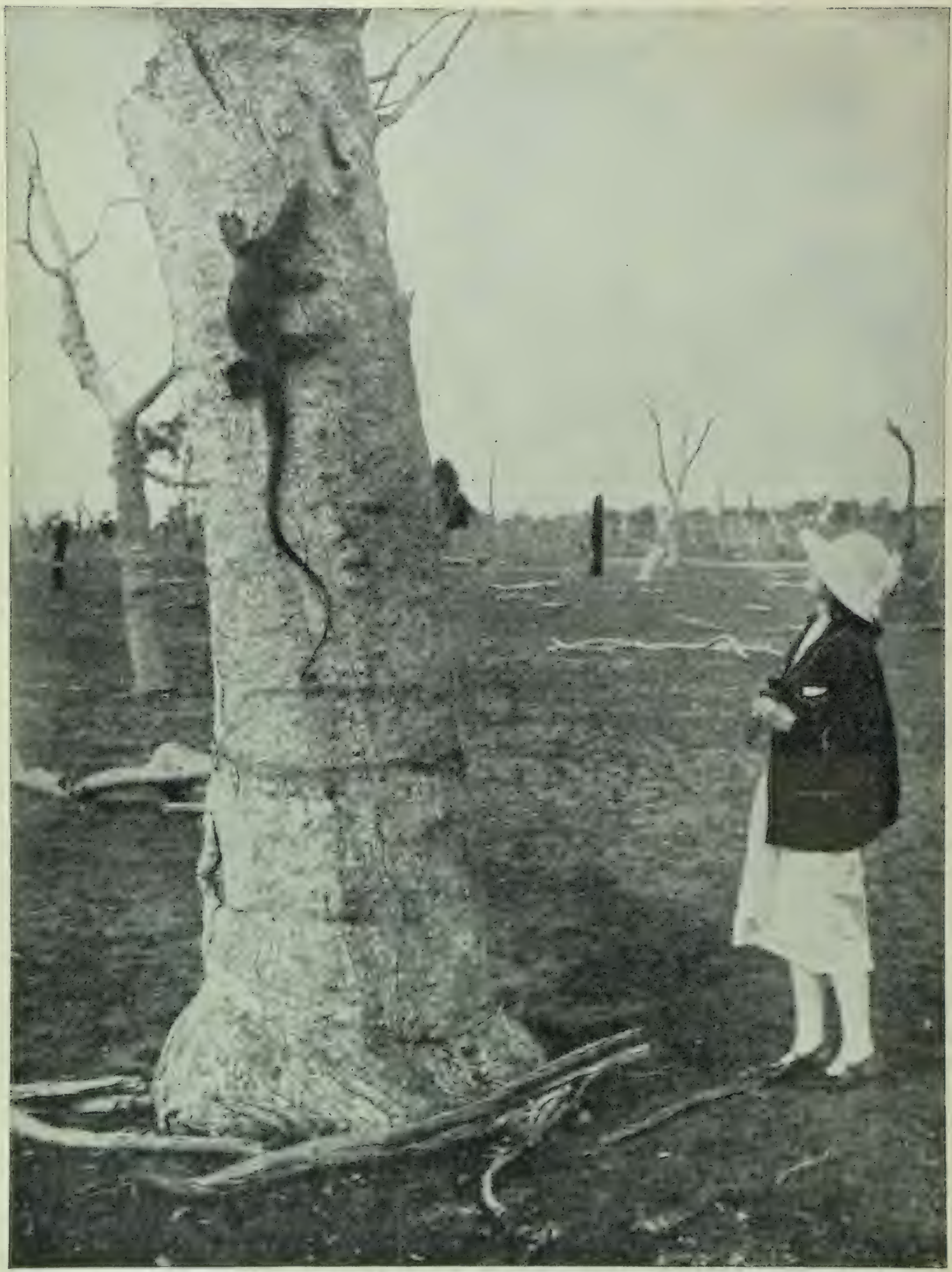
Other members of the Monkey tribe are more remote from the human race. Notable among these are the Lower Apes, such as the Barbary Ape of Northern Africa, and the Baboon. The latter, though so very ugly and dangerous, was formerly considered sacred and was worshipped in ancient Egypt. He has a long tail and a face very like a dog, and lives among the rocks in Abyssinia and southwards,

America has many strange monkeys, ranging from the Black and Red Howling Monkeys of the Amazon Valley to the little furry Marmoset of Central America and Mexico. One of the most curious is the Black-faced Spider Monkey, all arms and legs, slim and slight as the legs of a spider, and with no thumbs to his hands. The Gelada Baboon has a mantle of long hair on his shoulders, and so has the black and white African Guereza, who is hunted for his handsome coat. The Capuchin resembles a cowled monk ; the Diana Monkey has a long white beard and the American Woolly Monkey a close soft coat like that of a Teddy Bear. Most fantastic of all is the Mandrill, whose brilliant blue cheeks, bright red lips and nose, and orange pointed beard are surely unique in nature.

The monkeys, too, have their little cousins, small tree-climbing animals beneath them in the scale of life. Though some have monkey-like faces, they resemble monkeys in their anatomical structure rather than in their general appearance. Such are the Lemurs and the Tree-Shrews, the African "Bush Baby," whose real name is the Galago, and the beautiful large-eyed Loris of tropical India.

The long-armed Gibbon—another of the Ape family—looks very aggressive when facing the camera.

THE LIZARD LIKES TO BE UP A GUM TREE



The Lizard climbs leisurely up a gum tree, while an interested spectator looks on, no doubt expecting him to fail in his task. The Iguana, or Monitor Lizard, however, is a very clever climber. There are many species of Lizards. This specimen, which is nearly four feet long, has a forked tongue. It is common in Australia. [*E.N.A.*

AUSTRALIA'S QUEER WILD LIFE

The Kangaroo does not believe in taking a quiet stroll, but loves to leap through the air at great speed. [*E.N.A.*

AUSTRALIA'S wild life is unique. The Southern Continent is a sort of natural museum in which forms and phases are preserved which the rest of the world has forgotten.

Centuries ago this part of the globe was joined to the other land masses, linked with what is now Europe and Asia and Africa. Then, while life was still at a primitive stage, came mighty upheavals of the earth's surface. Land was thrust out of the sea ; vast tracts sank beneath the waves. Australia was isolated and her creatures found themselves marooned on an island.

There the tide of evolution barely reached them. Cut off from the great rough-and-tumble of rivalry and strife and effort which is Nature's way of evolving new species, they preserved their primitive characteristics almost unchanged. Now they afford us rich glimpses of the past history of the world.

WHY DOES NATURE PROVIDE SOME ANIMALS WITH "POCKETS"?

One thing they nearly all have in common —pockets or pouches in the front of their fur coats where their babies are kept. Pouched animals are known as Marsupials, from the Latin word for a pouch. The babies of these lowly mammals are born in a very feeble and helpless condition, and so must have extra protection until they are stronger.

Some of the Australian Marsupials correspond to the more highly developed types of other countries. There is an Australian "Bear" and a Tasmanian "Wolf." There are gliding animals like the Flying Squirrels and burrowing animals like the Mole. There are creatures corresponding to the Badger, the Otter, the Vole, the Cat and the Hedgehog, and all have this peculiar method of nursing their young.

HOW THE KANGAROO FINDS HIS STRONG TAIL USEFUL.

You remember the old riddle about beer being made in the Ark—"The Kangaroo came in with hops ?" Well, if he were there at all he certainly went in with hops, for it is his favourite mode of progression ! Sometimes he covers as much as thirty feet with a single flying leap. He is a large and handsome fellow, up to eight feet in height, with a fawn-to-brown (occasionally a gray) coat with lighter underparts. His head is small and his forelegs short and insignificant, but his long, sinewy, powerful hind limbs are developed out of all proportion to his body. It is with these he leaps, or "hops" ; and he uses them also as weapons (long, sharp claws give point to his dangerous kick), supporting himself meanwhile on his thick, enormously strong tail. He is a grass-eater and plays havoc among the crops.

Among the more important species are the Great Gray Kangaroo of the Eucalyptus forests, the Red Kangaroo of the desert interior and that sturdy grassland wanderer, the Wallaroo. A rare Antelopine Kangaroo also

The baby Kangaroo is tucked away inside a curious skin pouch in front of his mother's body.

occupies the tropical region of Northern Australia.

Pygmy forms are the Musk Kangaroo, the Tree Kangaroo and the Potoroo or Rat Kangaroo. The Tree Kangaroo is specially adapted for tree climbing, though he makes but lazy progress.

Nearly allied to the Kangaroo are the Wallabies, who also flourish here in a number of species. Though smaller in size, they resemble their better-known cousins very closely in manner and appearance. The Rock Wallaby, a rock-dweller and a vegetarian, is easily tamed, and is one of the most lovable of furry creatures.

HOW THE WOOLLY-COATED PHALANGER DOES HIS ACROBATIC TRICKS.

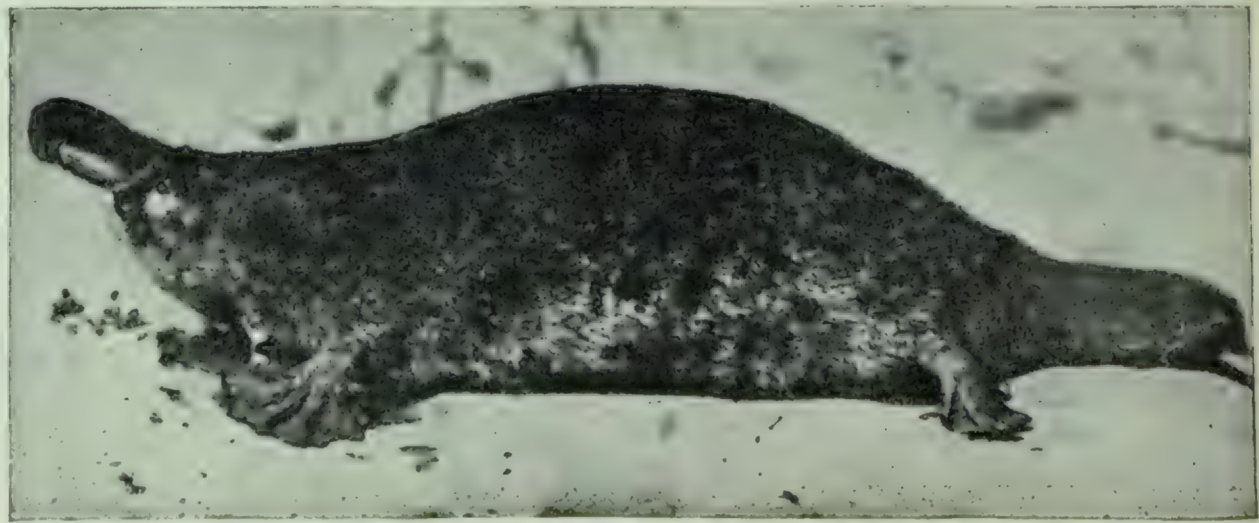
The Phalangers, or Australian Opossums, are related to the true Opossums of America, almost the only pouched animals found outside Australia. They, too, are vegetarians. They have thick woolly coats and grasping tails which help them to climb the trees. The Flying Opossum, furnished with a membrane between the fore and hind limbs, is a delightful aerial acrobat.

Bear-like in his gait and appearance is the Wombat of Tasmania and Southern Australia. A stoutly built creature with thick neck and broad flattened head, he hides in his burrow during the day and at night comes out in search of food. He is a vegetable feeder, gentle and harmless. The largest Wombat is about three feet in length.

Here we may mention another little Bear-like creature who is, in fact, known as the " Native Bear." He is the Koala, a relative of the Opossums and the Wombat, and a great climber. His woolly coat and his sulky, babyish little blunt nose are so like a Teddy Bear as to be quite irresistible.

THE FIERCE TASMANIAN DEVIL IS HATED AND FEARED BY ALL THE ANIMALS.

From such innocent children we pass to the bandits and brigands of the Marsupial tribe. The most hated and feared of them all is the Tasmanian Devil. This creature corresponds to the Old World Badger, whom he matches in size and build, but whereas the Badger is harmless when unprovoked, the Tasmanian Devil is a ruthless slaughterer, and will attack and overcome creatures much larger



The duck-billed Platypus has a bill like a duck, soft fur like a rabbit, webbed feet, for swimming, and lays eggs like those of a reptile. It lives in a burrow in the river bank.

The Tasmanian Devil is a fiery little fellow—always ready to start a fight. He attacks and overcomes creatures much larger than himself and will fight to a finish. [*F. W. Bond*

than himself. To the same class belongs the Tasmanian Wolf, another hideous killer of the night; also the Dasyure or Native Spotted Cat. The Dasyure is a stocky little animal, and in spite of his handsome white-spotted fur is not nearly so nice-looking as the true Cats.

So you see we have here a "Wolf," a "Bear," a "Badger," a "Cat," and many other animals who bear at least a faint resemblance to familiar types. There is one creature, however, whom you have still to meet, who is quite unlike anything you will find in other parts of the world, and who even here is almost unique. The Duck-billed Platypus, the queerest of all the Australian animals, is a mammal and yet it lays eggs. It is covered with short, thick fur, and yet it has webbed feet and can swim like a duck. Strangest of all, it has a beak!—or at least the appearance of one. A horny extension at the sides of its mouth makes its muzzle look exactly like a broad, flat duck's-bill. It is native to Tasmania and south-eastern Australia.

The energetic Tree Kangaroo finds it as easy to scramble up trees as to bound lightly over the ground. Rough pads under his feet help him to climb.

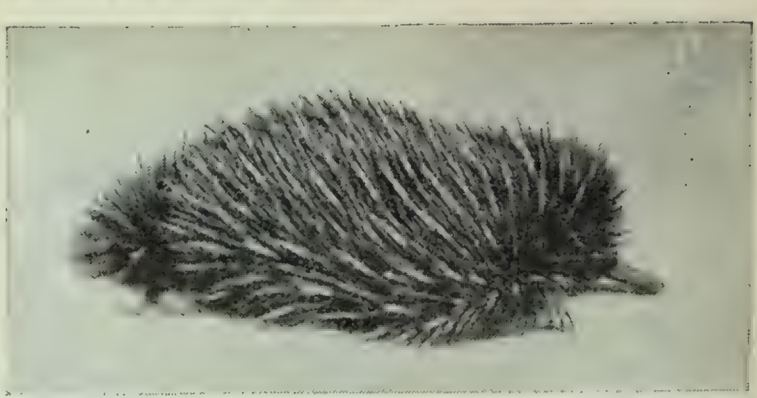
The Koala, or Australian Native Bear, which lives in the Antipodes, is one of the world's quaintest animals. [*E.N.A.*

The only near relative of the Platypus is the Echidna, or Spiny Ant-eater, also a native of Australia and Tasmania. This animal, too, is a mammal. It lays eggs and afterwards carries its young in a pouch. But instead of a "bill" it has a long round snout and a long sticky tongue with which it catches insects for tea. It is covered with prickly spines over a shorter coat of fur, and its fellow in the Old World is the Hedgehog.

Other animals there are in these regions, notably the Dingo or Wild Dog, and numerous

The short-headed Phalanger, or Australian Opossum, is a vegetarian. He wears a thick, woolly coat to keep him warm, and climbs trees in a very agile manner. [*F. W. Bond*

The Emu, found in Australia, is often mistaken for the Ostrich, which resembles it in many ways.



The Echidna, or Spiny Ant-Eater of Australia, finds his needle-sharp quills very useful when he is in danger.

The Kiwi, a native of New Zealand, is a rare bird, with a very long beak. It lays large eggs for its size.

species of Lizard, Turtle and Crocodile, but they are such as you may meet with in other countries. Those we have mentioned are nearly all peculiar to Australia.

THE GREAT LONG-LEGGED BIRD THAT IS VERY LIKE AN OSTRICH.

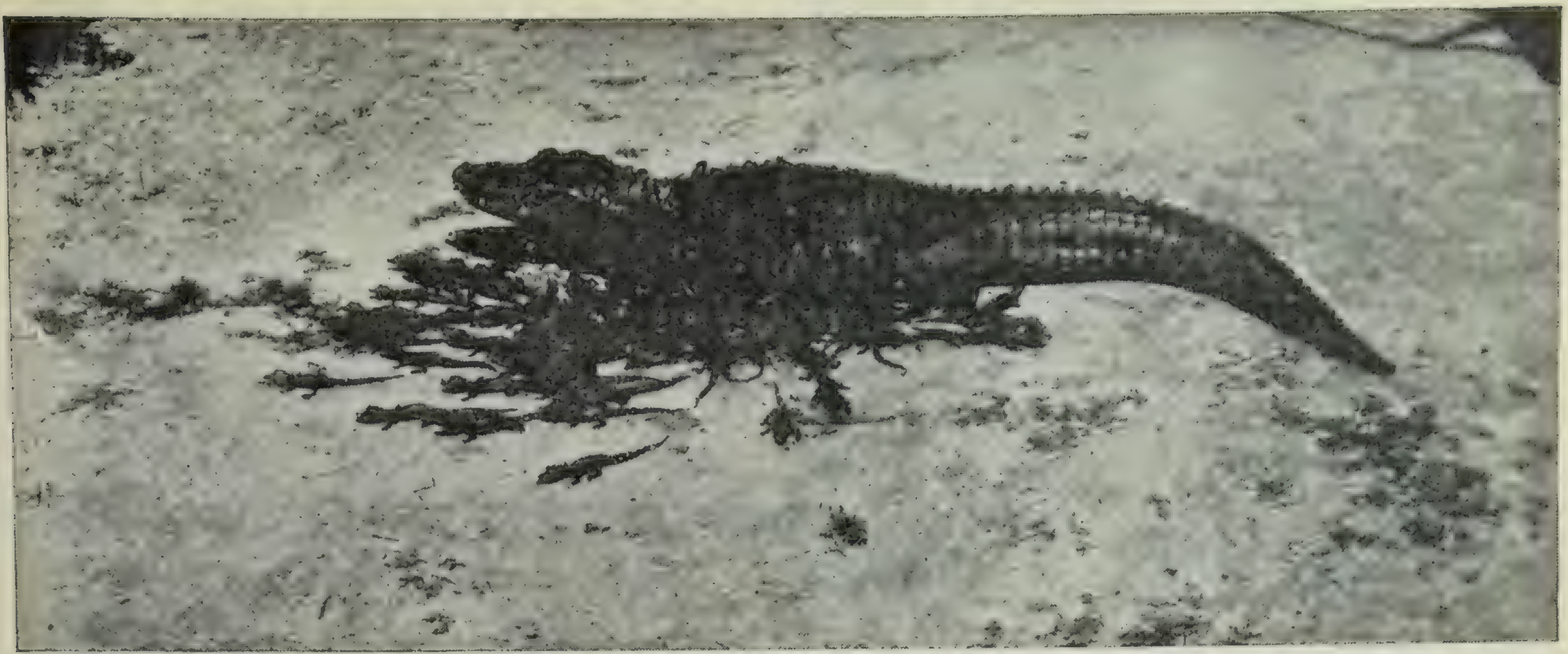
The feathered people of this island continent are no less remarkable. There is first of all the great Emu, a cousin of the Ostrich and the Rhea, whom he closely resembles. He is almost as big as the Ostrich, and like him is handsomely plumaged. Yet he cannot fly, and must depend on his long legs to carry him out of danger. Mother Emu lays her eggs in a hole in the ground, but, strange to say, it is Father Emu who hatches out the baby chicks, and these when they first appear are the oddest little balls of light and dark striped fluff.

Other strange birds you will meet with "down under" are the Laughing Jackass, or Kookaburra, who is really the Kingfisher of Australia, and the night-ranging Kiwi of New Zealand. The gurgling sound made by the Laughing Jackass, at regular times about dusk and dawn, has earned this peculiar name for it. Orders have been issued to protect this strange bird, because of its skill in killing reptiles and mice.

The Kookaburra, or Laughing Jackass, is distinguished by its curious gurgling cry as it flits about in the dusk.

Australia's birds, you see, are quite as curious as her animals. The reason is that the island is so far away from other land-masses of the world that it has retained its original types of birds and animals. The Kiwi is quite a small bird, no larger than the hen who lays your breakfast egg, but he does present a quaint appearance with his coat of wiry brown feathers and his long slim beak. He, too, must run swiftly, for the very good reason that he has no wings to speak of, and cannot fly.

SOME DRAGONS OF TO-DAY



This picture reminds us of the old woman who lived in a shoe! Mother Crocodile is taking her children for an airing.

WHO doubts to-day that the stories of the Dragons—those great, winged, fire-breathing, scaly monsters—belong to the primitive history of this queer old world? We can tell from the study of rocks and the science of fossil forms that some such creatures did actually heave their mighty bulk from the primeval ooze, and creep and waddle and fly over the surface of the earth.

DID YOU KNOW THERE WERE STILL DRAGONS IN THE WORLD?

They were, in fact, the Big Reptiles which preceded the mammals in Earth's history. When there were no Elephants, no Bison or Deer, when even there was no Mammoth or Woolly Rhinoceros, there were big Dinosaurs and Pterodactyls, and these or their successors were the Dragons of the past. You have read about these at the beginning of this book.

The Dragons of to-day are reptiles also, and though on the whole less appalling than those of the past, they are quite sufficiently Dragon-like in character. They do not breathe fire and smoke to burn up the country before them, but that is almost the only point in which they fail in the family tradition.

THE DRAGON WHICH SNAPS UP FISHES WITH HIS HUGE JAWS.

Largest and fiercest of the great Saurians is the Crocodile. Look at him as he lies on a mud-bank basking in the sun, or floats lazily downstream. He is more like an old dry log than a Dragon; yet let a creature come within his range and he flashes into life. One snap of his powerful jaws and the victim is caught as in a vice.

Do not imagine that the Crocodile sheds tears as he devours his prey. This is merely a fable. He is much more likely to

"... welcome little fishes in
With gently smiling jaws!"

And not only little fishes, but big ones as well, and anything else that strays within his reach!

The true Crocodile, native to North and South America, Asia, Africa, parts of Australia and the Fiji Islands, is a huge beast, sometimes exceeding thirty feet in length. He is known by his rather long triangular snout, great cavernous mouth furnished with formidable teeth, and fringed hind legs. Though he swims well he is less agile on land, where a slow crawl, or, rarely, an ungainly run, is the best that he can do.

HOW THE SUN BRINGS THE BABY CROCODILES TO LIFE.

In time of drought he suffers considerably from lack of food, though some species solve the problem of the drought months by going to sleep! Others, again, sleep through the colder months of the year. Baby Crocodiles, funny little animals, are hatched by the heat of the sun from the eggs which their mother has laid in the sand.

There are several well-known Crocodile species. The Salt Water or Estuarine Crocodile, one of the most formidable of the group, haunts the mouths or estuaries of large rivers. Other large species are in North and South America. The ugly Indian Mugger or Marsh Crocodile is venerated by the natives just as, centuries ago, the Nile Crocodile was worshipped by the Ancient Egyptians.

The Alligator of the southern United States and Southern China is distinguished from

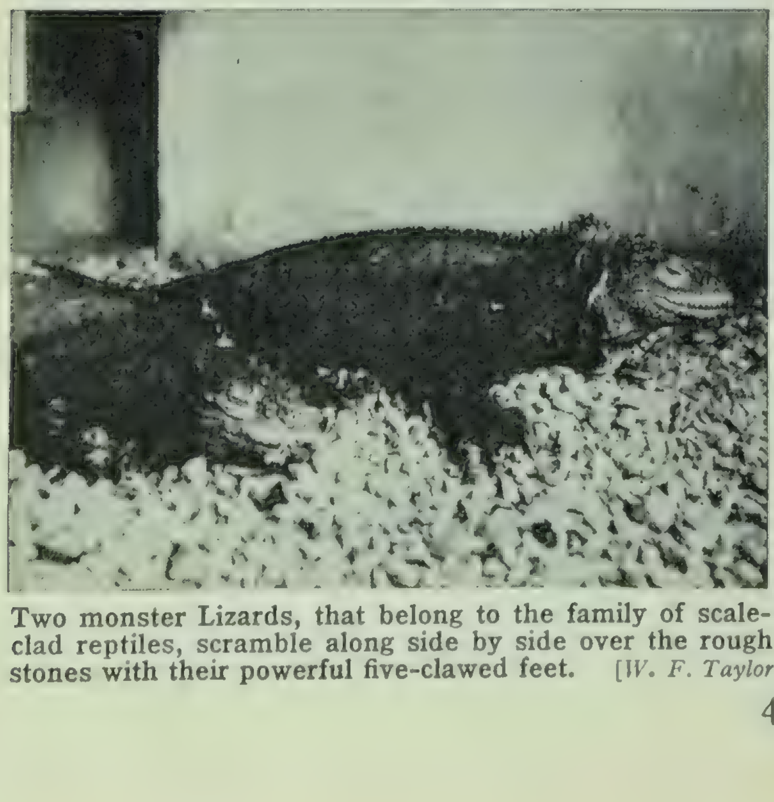
When the Alligator opens his giant mouth there is danger ahead. The picture shows him guarding his nest.

the Crocodile by his smaller size, broader head and rounder, blunter nose. An allied genus is the Cayman of Tropical South America, which also is generally smaller than the Crocodile, though one species, the Amazonian Black Cayman, reaches a length of quite twenty feet.

Yet another genus of this family comprises the Indian Gharial and his relative of Borneo and Sumatra. Their chief characteristic is the very long slender snout, and the mouthful of sharp teeth well adapted to fishing, and their home is generally inland on the banks of the rivers.

THE GIANT LIZARD THAT LIVES IN A FAR-OFF ISLAND.

Passing now to the Big Lizards, let us look first at the very biggest of the group, the Monitors, on one of whom the name of Dragon has actually been bestowed. The Monitors are found in Africa, in parts of Asia and in Australia, and are distinguished by their size and bulk, small scales and powerful five-clawed feet.



Two monster Lizards, that belong to the family of scale-clad reptiles, scramble along side by side over the rough stones with their powerful five-clawed feet. [*W. F. Taylor*

LIKE THE FAIRY-TALE DRAGON, HE IS A FIERCE CREATURE.

The Dragon of Komodo (an island of the Azores, in the Atlantic Ocean) was only discovered to science in 1912. He is as near to the Dragon of romance as one might wish to see—a giant among the Monitors, ten feet and more in length, bulky and powerful in build and consequential in mien. By day he roams about in search of food ; by night he sleeps in a great den or lair which he has dug beneath the roots of the trees. Like all the Monitors he is a *carnivore,* or flesh-eater, preying on even so large an animal as the Deer, but singularly docile with man.

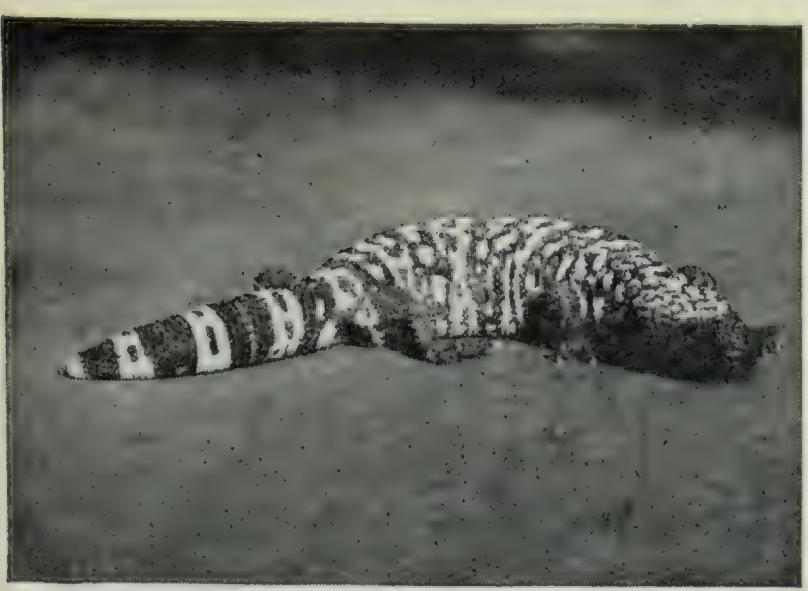
Other giants there are among the Monitors, such as those of the Nile and West African regions ; but for bulk and sheer impressiveness none of them can rival the Dragon of Komodo.

The Crocodile prefers fish for his morning meal and does not bother to cook it before setting his huge jaws to work. [*E.N.A.*

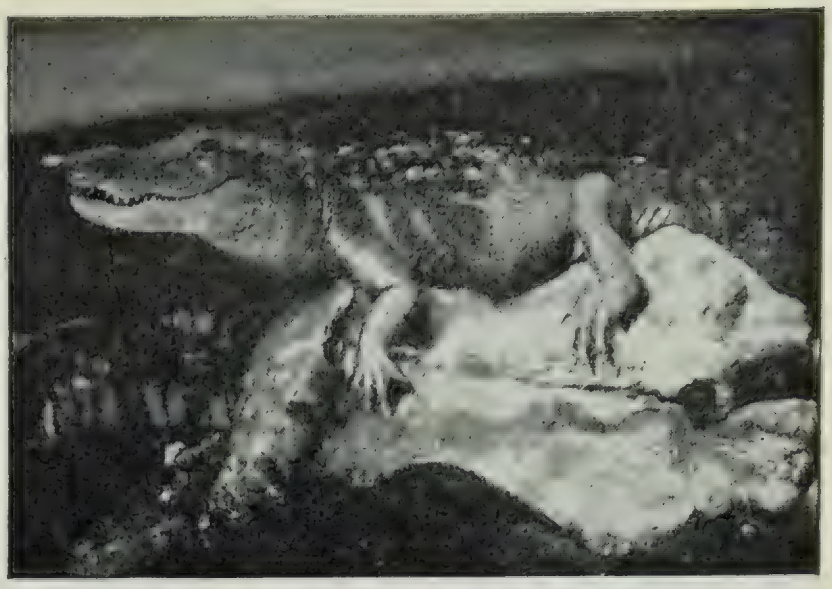
THE GENTLE DRAGON THAT IS VERY EASILY CAPTURED.

In the Galapagos Islands of the Pacific there is a species of Iguana which also bears a striking resemblance to a prehistoric monster. He is sometimes called the Sea-Iguana, because he is semi-aquatic and is found only on the sea coast. Though he is smaller than the Komodo Lizard (only about four feet in length) his sombre tints and rugged outlines give him a primitive aspect, and as he climbs over the black lava rocks to gaze on the Pacific, we may picture his prehistoric ancestor looking out on the morning of the world !

The Iguana is a leaf and fruit-eater, sometimes an insect-eater ; he never preys on the larger animals as the Monitor does. Fearless and docile with his captors, he allows himself



The Gila Monster, or Heloderm, with its patterned coat, is the only poisonous member of the Dragon family.



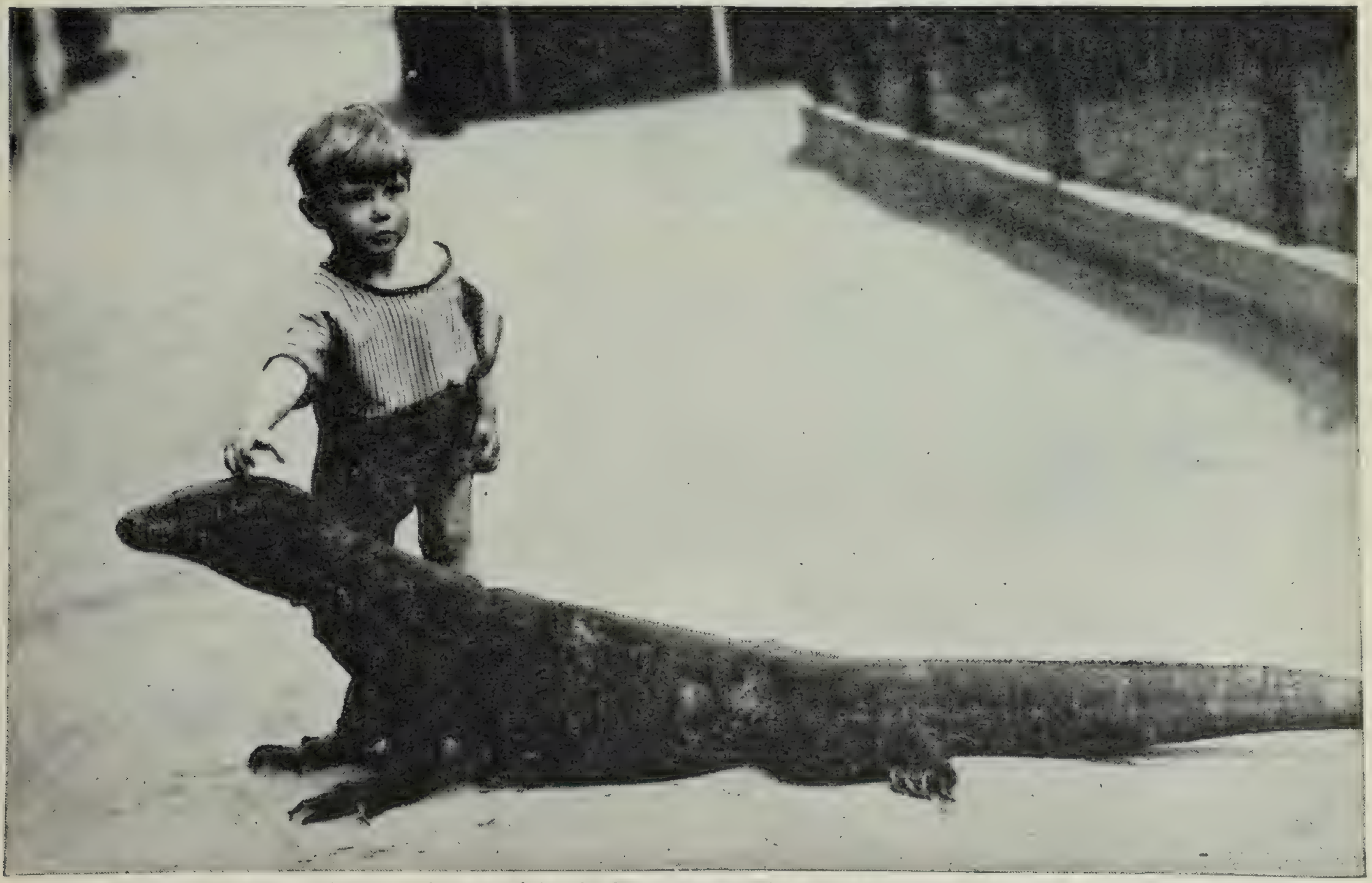
A "close up" of the Alligator, showing his scaly skin, which makes excellent leather. His toes are partly webbed.

to be easily taken, but unfortunately tends to pine in captivity. He is indeed the gentlest of all prehistoric monsters.

It is otherwise with the Rhinoceros Iguana of the coast of Hayti. His vicious mode of attack no less than his horned snout have gained him his name. His large head, gaping mouth and dark "iron-clad" colour give him a sinister aspect, and perhaps his temper is nearer to the true spirit of the Dragon of ancient days!

SOME of the lesser Dragons, such as the Gila Monster of Central America and the Hooded Basilisk, must be very terrifying to the smaller creatures. The Gila Monster measures about two feet, and is the only poisonous species of his tribe. The Basilisk, on the other hand, is entirely harmless and shelters a rather nervous and timid disposition behind his bizarre appearance.

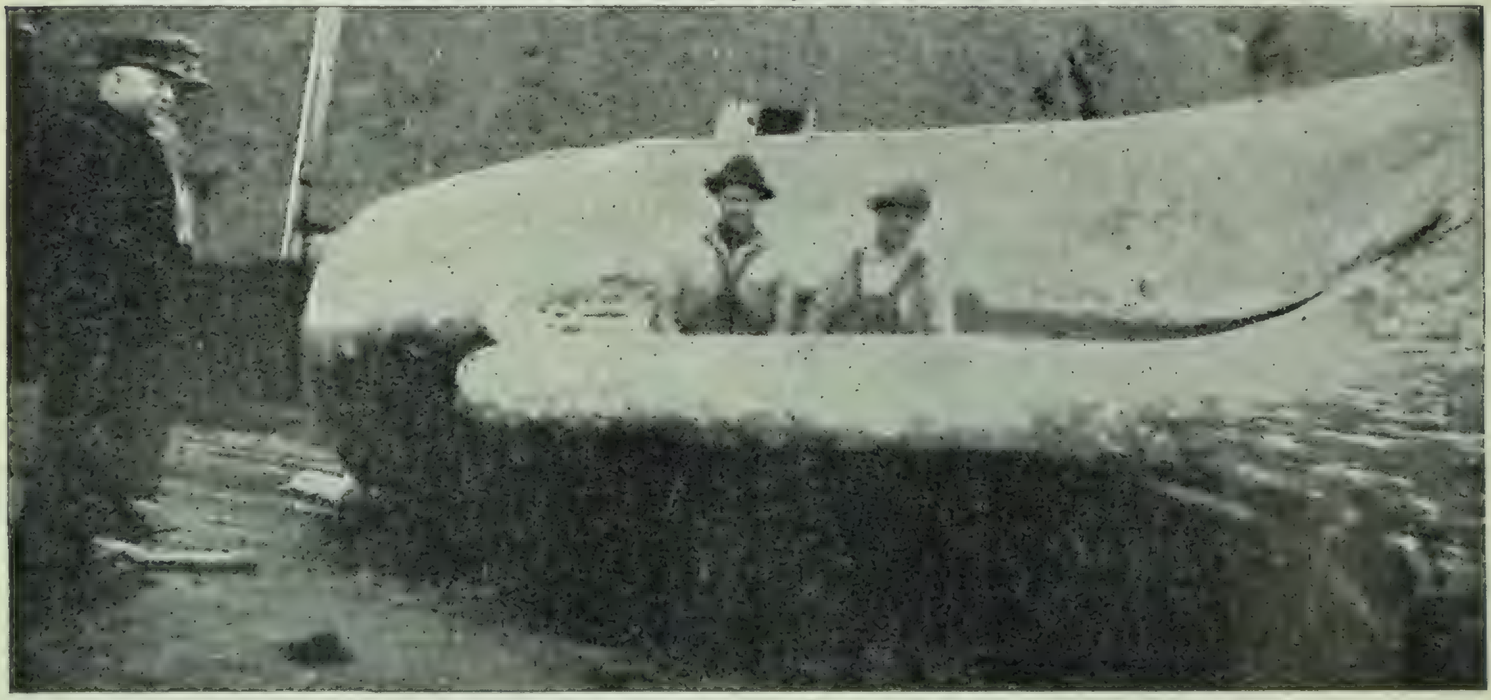
The Flying Lizard of the Malay region, though small, also merits inclusion among the Dragons, since he is the only living representative of the extinct Pterodactyl! He flies, or rather glides, by means of a membranous skin stretched between fore and hind limbs on either side, and is so brilliantly hued in flight, so sombre in repose, that when he folds his wings he seems literally to vanish!



The Komodo Dragon, discovered on an island of the Azores, is a huge monster, but is very docile with man.

HOW THE OCEAN MONSTERS ARE CAUGHT

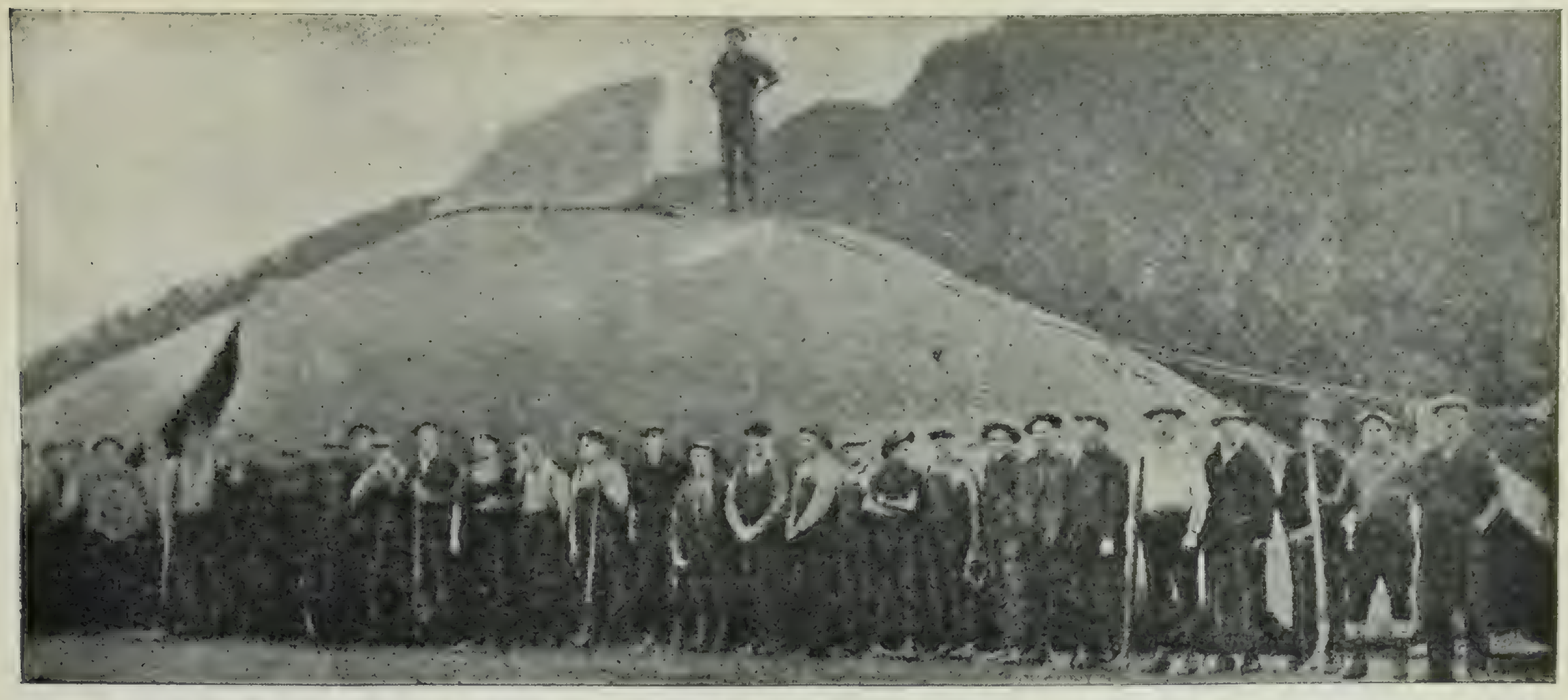
A whaler returning from a fishing expedition with a small whale in tow. Whales are very valuable, as the blubber from the Finback furnishes a large quantity of oil and the whalebone has many uses.



A picture of the great mouth of a Sperm—the only whale that has teeth—giving an idea of its gigantic proportions.

When the whalers come home with their haul, the whales are landed on slipways to be cleaned and the oil extracted. The picture shows where the sea-monsters take their last journey, before they are made to serve man's purpose.

THE WHALE—OUR BIGGEST MAMMAL



This mountainous Whale, beside which man seems a dwarf, is 15 feet high, 22 feet wide, 65 feet long, and weighs nearly 250 tons. The men are ready to cut up the giant and extract his blubber.

THERE is something rather magnificent about the Whale. Near the land or stranded on the beach he may seem a huge ungainly creature, but watch him sporting in the open sea, rolling through the tumbling gray waters, blowing jets of spray and vapour almost to the clouds! His size is nothing there; the giant is reduced to right proportions in a world of swinging seas.

HOW THE WHALE BREATHES—AND WHAT HIS "BLOWING" MEANS.

He makes his home in almost every ocean, ranging from pole to pole, right through the tropics, but chiefly in the Arctic and Antarctic and the colder temperate regions. A few of his kind may even be found in fresh water, but generally he is a real oceanic monster.

So well does he accord with his element that it is odd to think that once—long, long ago—the Whale was a land animal. But that is what his structure tells us; he is a lung-breathing, warm-blooded mammal, whose ancestors forsook the land and launched out into the deep. Now, however, we find him surprisingly well adapted to aquatic conditions. His feet have become flippers; his tail has broadened (crossways, not up and down like that of a fish) into a double-winged paddle with which he swims powerfully; his nostrils, or rather blow-holes, are placed right up on the top of his snout and lead directly to his windpipe, so that they can be closed when he is under water. His lungs also are adapted to his long periods under the water, sometimes reaching an hour, though fifteen to twenty minutes is his usual time. When he rises to the surface he expels the used air in a column of vapour resembling a waterspout, and then he is said to be "blowing."

The Whale is a veritable mountain of flesh. To see such a monster rising from the deep is rather like seeing an island springing into being! Do you wonder how so vast a bulk is kept afloat? The fact is that the Whale himself is a sort of lifebuoy, and carries his floating gear about with him. One species, the Sperm Whale, has in his head a big box filled with an oily or waxy substance called spermaceti which helps to buoy him up; but more important still is the thick coat of blubber (sometimes fully twenty inches thick), which the adult Whale wears underneath his skin. The same property which makes oil float on the surface of water gives buoyancy to this oily or fatty sheath.

WHY DOES THE WHALE HAVE SUCH A THICK CASING OF BLUBBER?

Naturalists believe that blubber may be useful to the Whale in other ways. For one thing, it may take the place of a fur coat, and is probably a much more effective way of keeping warm in the depths of the sea! The baby Whales, who have no comfortable blubber casing, are born in warmer latitudes.

Blubber may also serve the purpose of a camel's hump and help to keep the Whale nourished when food is scarce. Or again it may protect him in the deeper waters. He is a great diver. He heaves himself up, sometimes clean out of the water, then dives or "sounds" to a tremendous depth. Here the pressure of water is enormous; even the Whale's mighty frame must suffer if it were unprotected, so he clothes himself completely, as it were, in a pneumatic tyre, and rises uninjured to the surface.

These characteristics are common to nearly all the Whales, but, of course, in other ways the different species vary considerably. Roughly, they are divided into two great families—Whalebone and Toothed Whales—distinguished mainly by their method of feeding. As this is an important distinction let us look at them separately. The first group is the Whalebone Whales.

HOW THE WHALE CAN MAKE SUCH AN ENORMOUS MEAL.

This group comprises the true or "right" Whales — the Greenland Whale, the Atlantic and Southern Right Whales, the Humpback, Rorqual and Pacific Gray, the Fin Whale, the Blue Whale and the Pygmy. These have no teeth. Instead they have great fringed plates of "whalebone" or baleen, which strangely enough is a development of the ridges which most animals have in the roof of their mouths. Sometimes they are quite fifteen feet in length, while as many as three or four hundred have been found in a single Whale. Their purpose is to strain from the sea-water the minute creatures on which the great animal feeds.

The Whale dines simply. He merely swims along the surface with his mouth open, while into that capacious cavern go the waves, laden with the tiny creatures called (as a general name) "plankton." The water pours out at the sides of his mouth, the plankton, held back by the fringed blades of baleen, is swallowed. What an enormous quantity must be needed to make a meal for a Whale !

HOW THE WHALE PROVIDES MANY VALUABLE SUBSTANCES.

This whalebone, by the way, was one of the products for which the Whale was principally hunted in the past. The baleen from even a single large Whale, such as the now almost extinct Greenlander, might weigh over a ton and be valued at more than £2000.

Of the various species of Whalebones the Atlantic and Southern Right Whales are dwellers in the Northern and Southern Hemisphere respectively. Though at one time they were very abundant they have been hunted almost out of existence. The Greenlander, formerly abounding in northerly regions, has a large head, fully one-third the length of his body. The Pacific Gray is met with in the North Pacific Ocean. The Blue Whale, also called Sibbald's Blue Rorqual or Sibbald's Rorqual, is widely known in the cold and temperate regions of both north and south. He is not only the largest of the group but the largest of all animals, ranging up to 100 feet in length.

The Sei Whale yields curious black whalebone with white fringes. The Fin whale, or Razor-back, is dark above and pure white below, with the peculiar back outline which gives him his name. Then there is the Humpback with his round arched back and very long flippers. His average length is about fifty feet and his colouring generally dark marked with white—sometimes his flippers are white, or his fins.

Now we come to a very different order, the Toothed Whales, who feed on Cuttlefish and other large sea creatures. Their teeth may be few in number (sometimes only a single pair) but they weigh up to four pounds apiece and are quite formidable in action. These Whales have only a single blow-hole in place of the double blow-hole of the Whalebones.

DID YOU KNOW THAT THE WHALE FURNISHES US WITH PERFUMES ?

Most important of this group is the Sperm Whale, over sixty feet long, another monster whose head reaches to a third of the length of his body. He is found mainly in tropical waters, though sometimes farther north or south, and is hunted partly for the spermaceti which fills his great head cavity. Sometimes, too, masses of a gray substance called ambergris are found in the interior of the Whale, or floating on the sea in his neighbourhood. This substance, used in making perfumes, is exceedingly valuable, and the discovery of a considerable quantity is a windfall indeed.

Other members of this order are the Beaked Whales, including Cuvier's Whale and the Bottle-nosed Whale, both familiar in the North Atlantic. The White Whale or Beluga, pure white in colouring, is a picturesque beast, but, alas, he too is becoming rare.

The rather terrible name of Killer or Killer Whale is commonly applied to the Grampus, who, however, is more nearly allied to the Dolphins. Savage and voracious, he roams the seas in nearly every latitude, the terror even of the great Sperm Whale, who is fully twice his size. Such big game as this, however, seldom falls to his hunting, and he has to content himself with seals and even with fish and birds. Fortunately, he is very conspicuous in his "magpie" colouring of black and white, so that the creatures have time to get out of his way.

If one would find a figure of romance among those great sea beasts it would surely be the Narwhal of the Arctic regions. Light gray in colour, with darker spots, he is known as the Sea Unicorn, because of the unequal development of his tusks. The right may or may not be partially developed, but the left in the male is prolonged in a straight spiral horn like that of the mythical unicorn—more like, in fact, than anything else in nature. Reaching nine or ten feet in length, it is a formidable weapon and a real danger to ships and to parties encamped on the ice, which the Narwhal may suddenly choose to break into pieces.

WHALING IS NOT SO DANGEROUS AS IT WAS IN THE OLD DAYS.

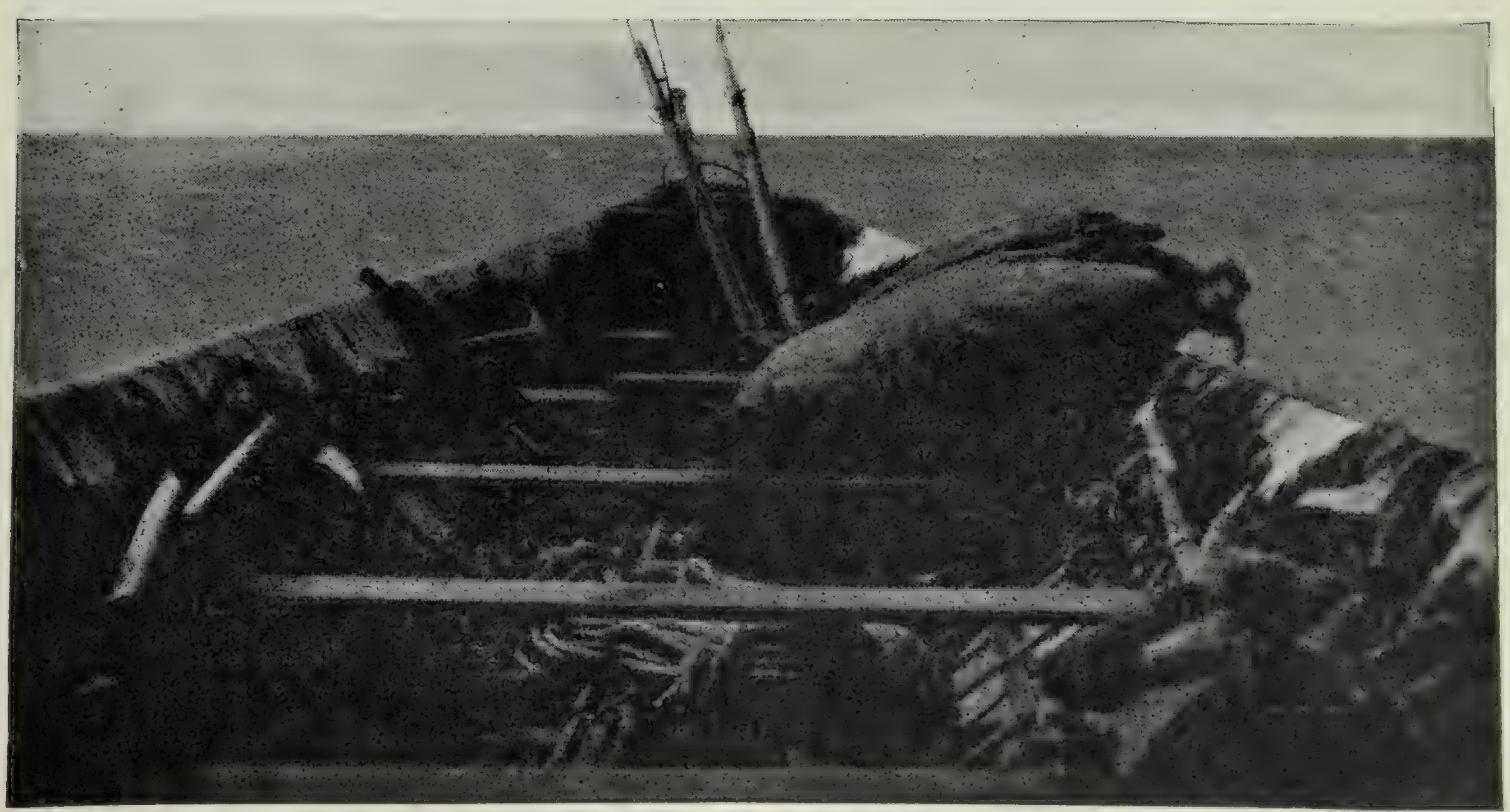
However, when you read of whaling and whaling ships it is not these fanciful creatures who are being hunted, but the rare Greenlander, the Blue Whale, the Humpback, the Rorqual and others of their kind. Modern whaling, though still a venturesome business, is not nearly so dangerous as in earlier times, when the Whale was attacked from open boats with harpoons flung by hand, while the mother-ship might be absent from port for three or four years, inflicting cruel hardship on the crew. The modern whaler is a seaworthy little steamer of 100 to 200 tons, carrying about a dozen men and mounted with a gun which fires an explosive harpoon at the whale, often killing him outright with the first shot.

HOW THE PORPOISE ENJOYS PLAYING AT SOMERSAULTS.

The true Dolphins are less awe-inspiring than the Whales. They are really sportive creatures. Perhaps you have heard of Pelorus Jack, whose pleasure it was to convoy ships through Pelorus Sound in New Zealand? During the Great War he disappeared and was never more seen. Pelorus Jack was what is called a Risso's Dolphin, but there are many other species. Generally they are "beaked," as some of the Whales are, and mostly they are soberly coloured, though there is a beautiful white Dolphin in the Amazon.

Some Dolphins have distinctly developed beaks, and are armed with some forty or sixty teeth. The common Dolphin abounds in the English Channel, and is an enemy of the fisherman.

Porpoises, too, have this amusing habit of following steamers in "schools," leaping out of the water, tumbling and somersaulting with as much gaiety as if they were a school of happy children! They are to be found in herds off the British, Scandinavian and American coasts, and live mainly on fish. Like the Whale, they too were once land animals—now they belong completely to the world of rolling waters.



A whaling canoe in the Behring Strait, filled with harpoons, guns and ropes, sets out in search of sea monsters.

THE TALLEST ANIMAL IN THE WORLD

A group of inquisitive-looking Giraffes with their heads high in the air. These long-legged animals cover the ground very swiftly. Their spotted coats are so like the tints in the trees that it is easy for them to escape notice.

HERE and there as we traverse the wilds we meet with a giant among the creatures. In the snowy Arctic it is the Polar Bear, who rears himself to his magnificent height of nine feet or more. In the hot, wet jungle it may be the huge seven-foot Gorilla or the mighty African Elephant. They are giants indeed, but what would you say to a creature who was taller than any of these—who is fully twice the height of the great white Polar Bear, and who makes even the African Elephant look small ? The Giraffe, who roams in herds through the open, woody country south of the Sahara, is the tallest of all the animals.

THE GRACEFUL CREATURE THAT GALLOPS SWIFTER THAN A HORSE.

Picture him as he wanders through the desert-like country among the scrub and the scattered mimosas. His neck and his legs are immensely long and slim. His yellow and brown spotted short-haired coat is so nearly the tints of the trees that if he were standing still you might never notice him at all. Beneath his coat his hide is so thick that it can easily withstand the prickly scrub through which he has to pass.

We may note also that he is very much broader at the chest than at the rump, while the rather steep slope of his neck is continued downwards along his back, so that he stands much higher at the shoulder than at the tail. Naturally, his fore legs are longer than his hind legs.

Surmounting his graceful head is a pair of horn-like erections covered with skin and crested with bristles, and between the two (but nearer his nose) is a bony knob which looks like a third horn ready to sprout !

DO YOU KNOW ANY ANIMAL THAT HAS MORE THAN ONE STOMACH ?

Though from his size we might imagine him to be one of those primitive survivals who are quite out of scale with modern life, yet we find him admirably adapted to his present-day surroundings. He is a vegetarian feeder, and in a grassless region has accustomed himself to look for his food where only it is to be found—among the tops of the tall trees. His long legs reach up so far ; his long neck almost completes the distance. If there is still a bit to go he shoots out his long tongue (a foot and a half in length !) and gathers in his lunch of leaves.

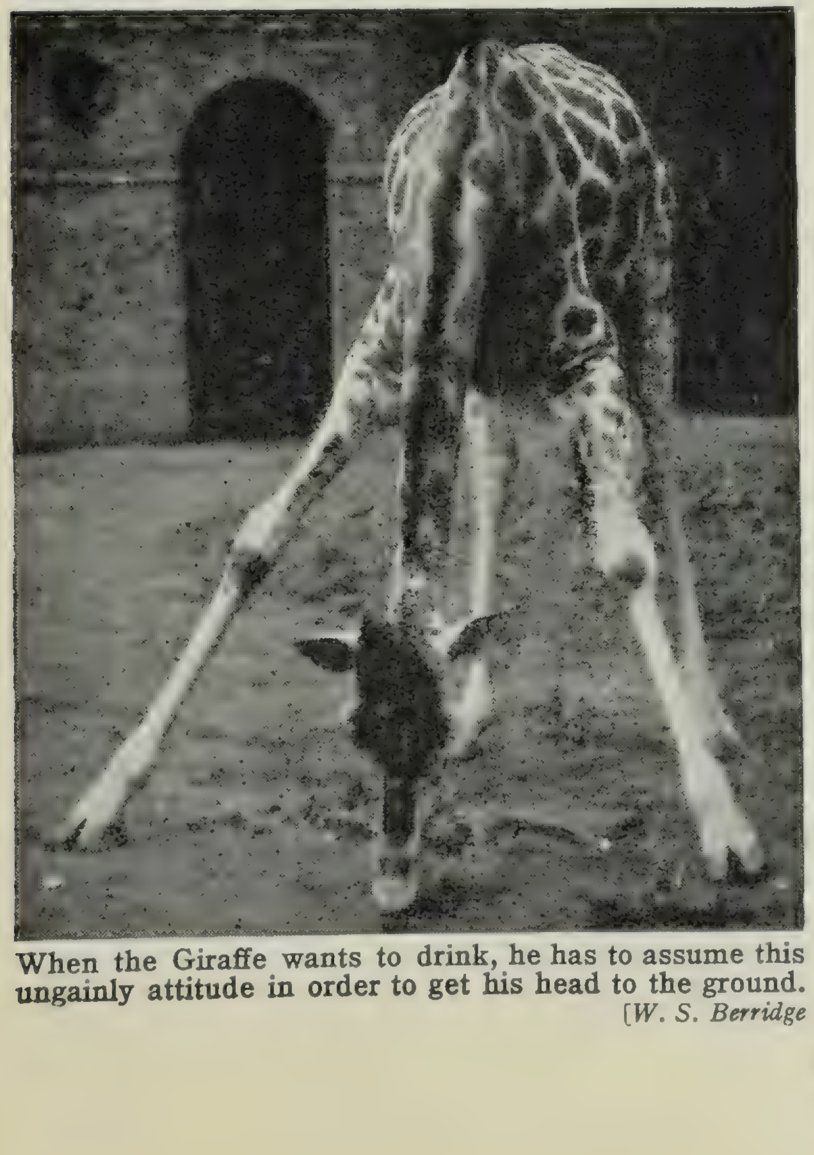
Long as his neck is, it sometimes happens that it is not long enough ! When he wants to drink, for instance, he cannot get down to the water without spreading his fore legs apart in a very ungainly fashion. Fortunately, he does not often want to drink ! He is almost a desert creature and can go for long weeks without water. Neither does he worry about irregular meals. He is a ruminant, which means that he has several stomachs, and can swallow a meal in haste and chew and digest it afterwards at his leisure.

As you may guess from his large and beautiful eye he is an intelligent animal, blessed with an easy and equable temper. Of course he will fight in self-defence; and even his fiercest opponent stands little chance in such an encounter. His head and powerful neck he uses mallet-fashion to deliver a blow of tremendous force, while his kick is more effective than that of the ostrich or kangaroo. However, his motto is "flight" rather than "fight," and his curious "rocking-horse" gallop enables him easily to outdistance his swiftest pursuers.

HOW THE GIRAFFE CAME TO BE CALLED THE "CAMELOPARD."

The ancient Greeks thought the Giraffe was a mixture of Camel and Leopard, so they called him "Camelopard," a romantic-sounding name which is not quite forgotten even now. Superficially, at least, there were some grounds for confusing him with those two animals. For was not his beautifully-patterned coat just like that of the Leopard? While, like the Camel, he had long neck and limbs and could go for many days without water.

Modern scientists, however, could not see in him a Camelopard. They were inclined to regard him as a solitary creature, bearing no very close relationship to any of the other animals, except of course to other Giraffes, Giraffe cousins such as the purplish-brown species of Somaliland, differing only in minor ways from the main type. Then, just at the beginning of this century, a British explorer discovered the Okapi, a creature who, while not a Giraffe, yet obviously belonged to the same family.



When the Giraffe wants to drink, he has to assume this ungainly attitude in order to get his head to the ground.
[*W. S. Berridge*

Mr. and Mrs. Giraffe condescend to pose for the camera, but hold their heads haughtily in the air and gaze at us in disdain from their great height.

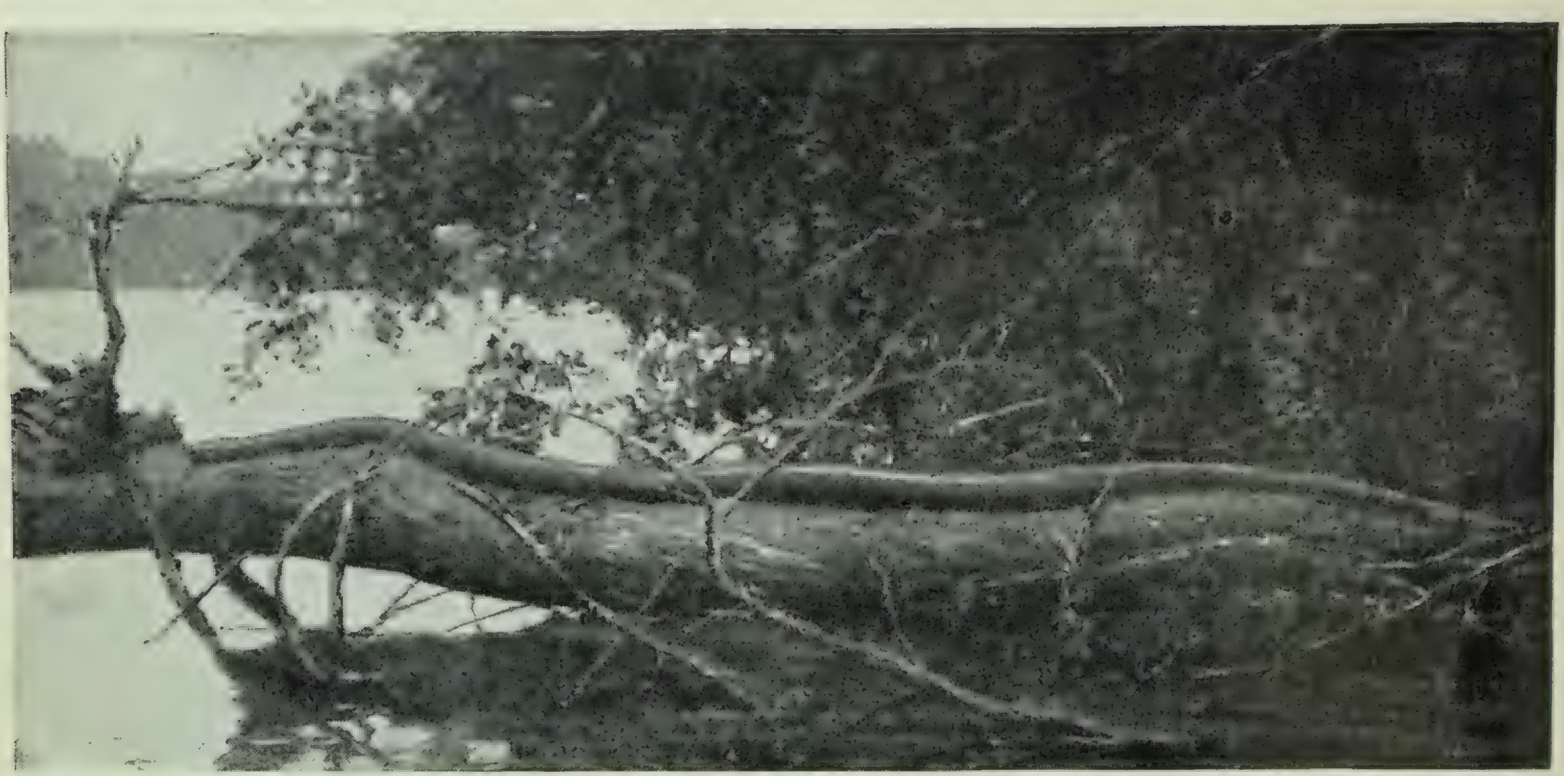
THERE ARE MANY QUEER COUSINS OF THE GIRAFFE FAMILY.

The Okapi is not nearly so tall as the Giraffe. When he is fully grown he measures only about five feet at the shoulder. Also, his neck and limbs are shorter in proportion to his body, and his purple-brown colouring is varied with black and white zebra-like rings on his legs. His horns are not entirely skin-covered like those of the Giraffe, but have a protruding tip. One old Dutch writer called him a Unicorn; so there you have a link, however fanciful, between two such diverse creatures as the Rhinoceros and the Giraffe.

The Okapi, like his larger relative, is native to Central Africa, but whereas the Giraffe loves the open and wanders in herds over the sun-dried sub-desert, the Okapi is found in the dense forest jungle where the sun's rays hardly ever fall.

Perhaps the most interesting thing about the Okapi is that, to the scientist who carefully examines his bony structure, he does indeed seem to bridge the gap between the prehistoric Samotherium and the Giraffe of our own times, who thus falls into his place in the great scheme of evolution.

SNAKES AND THEIR HABITS



A large serpent, the Anaconda, rests along a tree on the bank of the Amazon. It is brown, with black spots. [*E.N.A.*

HOW beautiful the Snakes are! Gorgeously patterned in black and gold, in greens and blues and crimson—festooning the trees in tropical forests, gliding on the banks of great rivers or wriggling with surprising agility over our British countryside!

In spite of their beauty and grace they are by no means popular people. Perhaps we remember the curse that was laid on them in the Garden of Eden; or perhaps we remember simply that year after year they bring death to thousands of our fellow creatures in various parts of the world.

There are countless species of Snake, distributed in nearly all hot and temperate countries, except New Zealand and Ireland. There are Wood Serpents and Water Serpents, Rock Serpents and Sand Serpents, and some that burrow underground. The majority are quite harmless. Though the venomous Snakes are justly dreaded, some of the non-venomous kind (the "crushing" Snakes) are still more deadly. All are scaly, cold-blooded creatures, descendants of the Big Lizards of former days, though now only a few have even vestiges of limbs.

You have probably all heard of the Boa Constrictor. The Boas and Pythons are very closely related, both forms attaining a very large size, and being characterised by the habit of crushing their prey to death before swallowing it whole. There is one other type of large serpent that does the same thing, and that is the Anaconda of South America, which perhaps attains the greatest size of all, specimens of thirty feet in length having been reported. The Boa reaches a length of over twenty-four feet, while there are stories told of thirty feet Pythons that have been killed in the Malay region.

The home of the Boa Constrictor is the dense tropical forest, and there it lives amongst the trees, climbing from branch to branch, as it searches for its prey. One of its favourite foods is the monkey, for which it lies in wait coiled up in the fork of some great tree, or stretched along some branch, looking exactly like a huge creeper. The Boa is also very fond of deer meat, and will lie for days beside some path in the jungle, till an unsuspecting animal comes by and is seized.

HOW IS IT POSSIBLE FOR A SERPENT TO SWALLOW A WILD ANIMAL.

To judge from the size of the Boa's mouth, as the great serpent lies at rest in its cage in the Zoo, you would never suppose that it could perform such a feat as to swallow a wild boar whole, yet that is just what it can and does do. It manages this because of the fact that its bottom jaws are not joined together at the chin as in most other animals. This means that the only limit to a Boa's swallowing capacity is the elasticity of its skin, and since the latter can stretch a good deal more than a stocking, you will see how the huge snake manages its horrible meal.

Once the Boa has disposed of such a meal, it finds some quiet spot and goes to sleep for several weeks. There, as it lies, the powerful digestive fluids of its stomach get to work, and in due course the mass of flesh, bones, hair and hide are dissolved and disposed of. Then the Boa wakes up again, and resumes its hunting. It may be weeks again before it succeeds in making another capture, but that does not worry it, for its system is adapted to long periods without food. Every few weeks the Boa changes its skin, as, indeed, do all snakes. When the new skin appears, the Boa is a most handsome creature to look at, for it is all brown and yellow, mottled and streaked with black, while there is often a fine sheen over its scales like that on the scales of a fish.

HOW SOME SNAKES CAN MAKE A KIND OF HOOD OF THEIR NECKS.

There is one peculiarity about these large serpents that does not occur in the smaller species that we know, and that is that they possess two claws at the base of their tail, which are the rudiments of hind legs.

The Boa does not lay eggs, as do most of its kind, but is viviparous, which means that the young are born alive.

Deadliest of the poisonous snakes is the Cobra, native of India and other hot countries. Though his fangs are fixed, and therefore not such lightning strikers as the hinged fangs of the Rattlesnake, his venom, acting on the nervous system, is very strong and his bite is quickly fatal.

The Cobra is a "hooded" snake. When he is disturbed he stretches the framework of his ribs to make a sort of hood of his neck—quite different from such Snakes as the Puff Adder, who "puff" or inflate their necks with air.

The commonest species is the Indian Cobra, over five feet in length, light brown or yellow in colour. A larger Cobra, called the King Cobra or Hamadryad, reaches a length of twelve feet. The Hooded or Egyptian Cobra and the Black-necked Cobra are Africans. One curious type, the African Ringhals, spits venom with unerring accuracy into the eye of his enemy, often causing a total loss of sight. The smaller Cobras live chiefly on rats and mice, frogs and such small creatures, the larger on other snakes.

The Hooded or Egyptian Cobra is a native of Africa. The King Cobra with its poisonous fangs is 12 feet long and lives on other snakes and mammals. [*F. W. Bond*

The deadly Boa Constrictor—a huge serpent that crushes its prey before swallowing it whole, makes its home in the dense tropical forests. [*F. W. Bond*

Nearly as deadly as the Cobras are the Kraits, also found in India, while the terrible Mamba, a climbing member of this family, inhabits the dense tropical jungle of South America. In America, too, one finds the Coral Snakes, highly poisonous but beautifully dressed in "warning" colours of coral-red and black. One species has enormous poison glands, a third of its body in length, and a red colouring on the underside of its tail which it displays when annoyed. Australian relatives of the Cobra are the Death Adder, something like a viper in appearance, the Black Snake and the Tiger Snake.

HOW THE RATTLESNAKE CAN WARN HIS ENEMIES BY HIS "RATTLE."

The Rattlesnake is another deadly creature, a kind of Viper distinguished by his "rattle" a series of bony cups at the end of his tail which rattle a warning to his foes. The little Rattlesnake, who is born alive, not in the egg as so many snakes are, has no rattle. But like all snakes he sheds his skin periodically, and each time he does so the bony tip of the old skin is retained to become a new cup in the rattle.

His poisoning mechanism is very highly developed. The hollow fangs, communicating with the poison glands, are attached to a hinged plate in the upper jaw and are capable of being erected or folded flat against the

The common Viper, or Adder, makes its home in Britain, and is the only venomous snake to be found there. [*F. W. Bond*

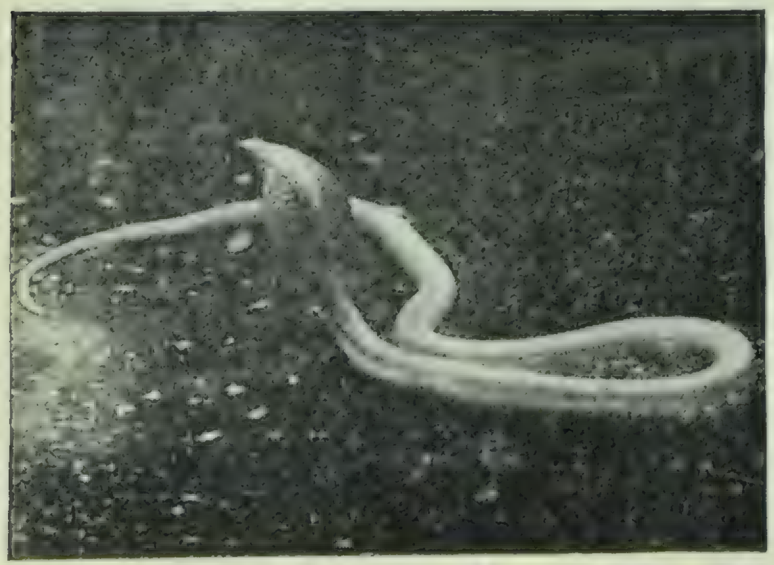
palate. The venom acts directly on the blood and is very deadly, though not quite so deadly as that of the Cobra.

The dangerous Diamond Snake of the Southern United States reaches a length of eight feet. Farther north are the Prairie Rattler and the Timber Rattler. The Fer-de-Lance, Jararaca and the giant Bushmaster are natives of Central and South America.

SOME MEMBERS OF THE SNAKE FAMILY AND THEIR CURIOUS HABITS.

Allied to the Rattlesnake is the true Viper found in many parts of the world. In desert Africa is the handsomely patterned but very poisonous Puff Adder, while the gaily coloured Gaboon Viper is a product of the African jungle. The Horned Viper of the Egyptian region is distinguished by a little horn-like arrangement above each eye. In India is the dreaded Tic Polonga, reaching a length of five feet, and finally, we have in Britain the common Adder, who is the only poisonous snake in these islands.

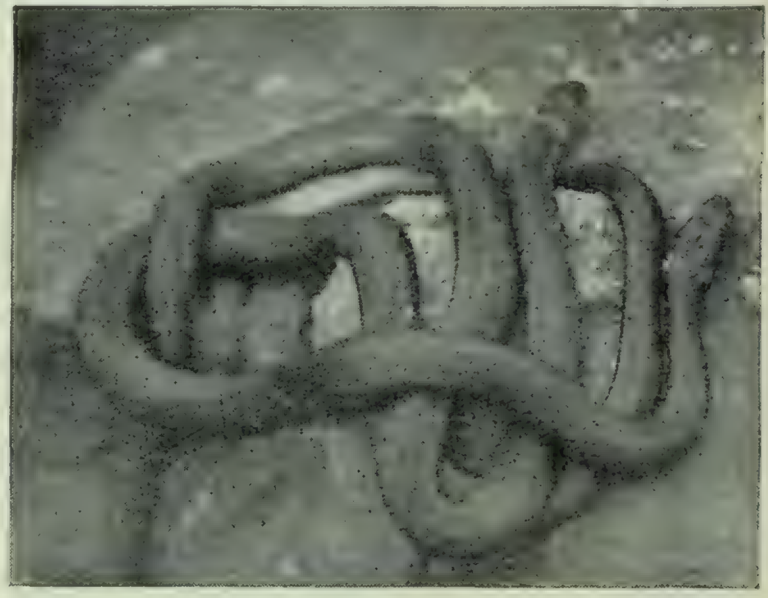
The Colubrids form what is quite the largest family of the snakes, including most of the commoner kinds. Some that we may mention are the Grass Snake and Smooth Snake of our own country, the latter sometimes mistaken for his poisonous brother the Adder; the King Snake of North America, who though non-venomous is a "crushing" snake and dangerous to his own kind; and the harmless Hog-nosed Snake, whose defence it is to look as like a Viper as possible. Others are fond of mimicking the colours of the poisonous Coral Snake, though they have not his venomous qualities.



The Indian Cobra is the deadliest of the poisonous snakes. Its venom is very strong and its bite fatal. [*F. W. Bond*

The poisonous Colubrids are "back-fanged" snakes. Some of their back teeth are grooved to convey the venom, which naturally is more difficult to administer in this way. The Boomslang of South Africa and some others have hoods; not, however, the genuine hood of the Cobra, but a mere puffing up of the wind-pipe with air.

It is one of the Colubrids who attempts to fly! You would not think that a snake would try to fly, but there it is. Since, like the Flying Lizard, he has no wings, he compresses his body into a sort of parachute, and in this way he glides for quite long distances between the branches. He is at home in India and the Malay region and, of course, is a tree dweller.



The Grass Snake is often mistaken for the poisonous Adder, though it is really quite harmless and not poisonous. It lives on frogs and fish. [*F. W. Bond*

A genus of Sea-Snakes, numbering over fifty species, is found in the shorewise stretches of the Pacific and Indian Oceans, often near islands. They are quite different from the freshwater snakes of the rivers and estuaries, and in many ways are especially adapted to their ocean life. Their scales are smaller, for one thing, and their nostrils have valves so that they can be closed under water. They are found up to eight feet in length, rather stoutly built, usually black with yellow underparts or vaguely ringed or striped. Though venomous they are not at all aggressive, and will never attack unless provoked.

ANIMALS THAT HAVE LOST THEIR LEGS

Seals love to stretch themselves on the rocks and bask in the sun after a strenuous swim in the water.

THE early ancestors of the Seals were land animals. Why did they turn to the sea? Was it that the weather was growing warmer, and it was more and more a delight to slip into the cool green water? Were they trying to escape from land enemies, or had their food given out and must they voyage in search of fresh supplies? Any or all of these things may have driven them to sea.

Many of their characteristics remain unchanged. They are warm-blooded, lung-breathing creatures, producing their young alive, wearing their sealskin coats as in the days of old. Yet in other ways they have adapted themselves very completely to their submarine life. Their feet have become flippers, the fore limbs having five webbed toes with the claws still upon them, the hind limbs turned backwards and quite useless on land. Then like the Whales they have developed blubber coats under their skin, to give them buoyancy and keep them warm.

HOW THE BABY SEALS LEARN TO BECOME EXPERT SWIMMERS.

They are a sociable people, the Seals, living together in herds, which usually consist of an old Seal (as herd-leader) with a number of his wives and children, and a few young males or " bachelors." The adult Seals, though they love to lie on the rocks basking in the sunshine, are famous swimmers and expert performers in the water, but the babies, who are born ashore, are unable to swim until they are a month old, and then they have to be taught by their parents!

Seal language as we hear it at the Zoo is a short, sharp bark. Did you know that Seals could also sing? Some people maintain that they can, though generally when we come to listen all we hear is a single plaintive note, or sometimes two, which together may seem to form a musical cadence.

THE ESKIMOS RELY ON SEALS TO SUPPLY THEM WITH FOOD AND CLOTHING.

Of the various species the Common Seal is known both in the North Atlantic and the North Pacific; the big Gray Seal (he is about eight feet long) in the North Atlantic only. The Fur Seals, once widely hunted in the islands of the South Seas, are sadly reduced in numbers. Almost the only remaining " rookeries " (as their communities are called) are those on the Lobos Islands at the mouth of the River Plate and those on the little Pribyloff Islands of Alaska, and they are now protected by law and preserved because of their valuable products.

To the Eskimos in their distant homes the Seals are all the necessaries of life rolled into one. Seal meat is their staple food; Seal blubber is burned both for fuel and light; Seal skins are made into warm clothing—and the skins are sewn together with a needle made of the sinews of the Seal! The native canoe, or

The Sea-Lion is a stately fellow, and can be trained to perform marvellous balancing feats with his snout. Like the land lion, he wears a mane.

kayak, is also made of Seal skins stretched on a light framework of bone. Luckily for himself and his family the Eskimo is a skilled hunter, and when he goes afield with his harpoon and "killing iron" he seldom fails to find a victim. Other enemies of the Seal are the deadly Killer Whale at sea, and on land the Polar Bear.

THE SEA-ELEPHANT IS FOUND IN ANTARCTIC WATERS.

A member of the Seal family, the Sea-Elephant, gets his name from the shape of his snout, which is long, bulky and decidedly trunk-like in appearance. His size, too, is elephantine, the southern species reaching twenty-one feet in length. This monster ranges through the Antarctic and is seen around the Falklands and other southern islands. The Northern Sea-Elephant is smaller. Though formerly very plentiful in tropical waters he is now seldom seen. Both have been much hunted for their oil.

A spotted coat distinguishes the Antarctic Sea-Leopard and makes him one of the most striking members of his tribe. He is about twelve feet long, a really handsome beast with a taste for penguins. One might think those solemn soldier-birds look too amusing to be eaten, but evidently the Sea-Leopard does not think so!

Like these others, the Sea-Lion has a certain superficial resemblance to the land animal whose name he bears. In this case it is a mane, more pronounced in some of the species, which gives him his distinctly leonine look. Of the various kinds we may notice the Northern Sea-Lion of the Pacific; the Patagonian, who is the typical maned species; and the Californian, who may be seen performing the most marvellous balancing feats at circus or carnival.

THE WALRUS HAS BEEN HUNTED SO MUCH THAT SOME OF THE SPECIES ARE ALMOST EXTINCT.

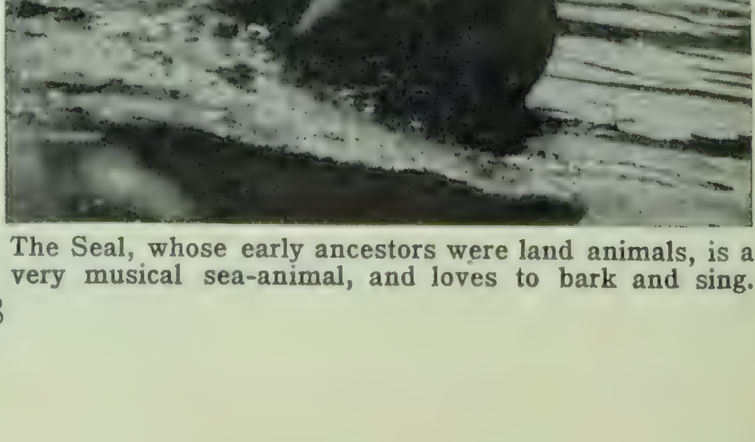
The curious characteristics of the Walrus are familiar to most of us—his long heavy tusks, his "Walrus" moustache, his broad, webbed flippers and short, stubby tail. He is ten or eleven feet long and rather scantily clad in a coat of reddish tawny hair.

The home of the Atlantic Walrus is in the far north. If not exactly genial he is a gentle, amiable beast and quite docile with man. Still he is not to be trifled with, for those big tusks of his can account for a Polar Bear. Generally they are used to dig out his diet of shellfish from the ocean floor. The Pacific Walrus belongs to another species, distinguished by the longer and slimmer tusks. Like the rest of the Seal family, and indeed like all peaceful wild creatures who are valuable to man, they are being hunted to extinction.

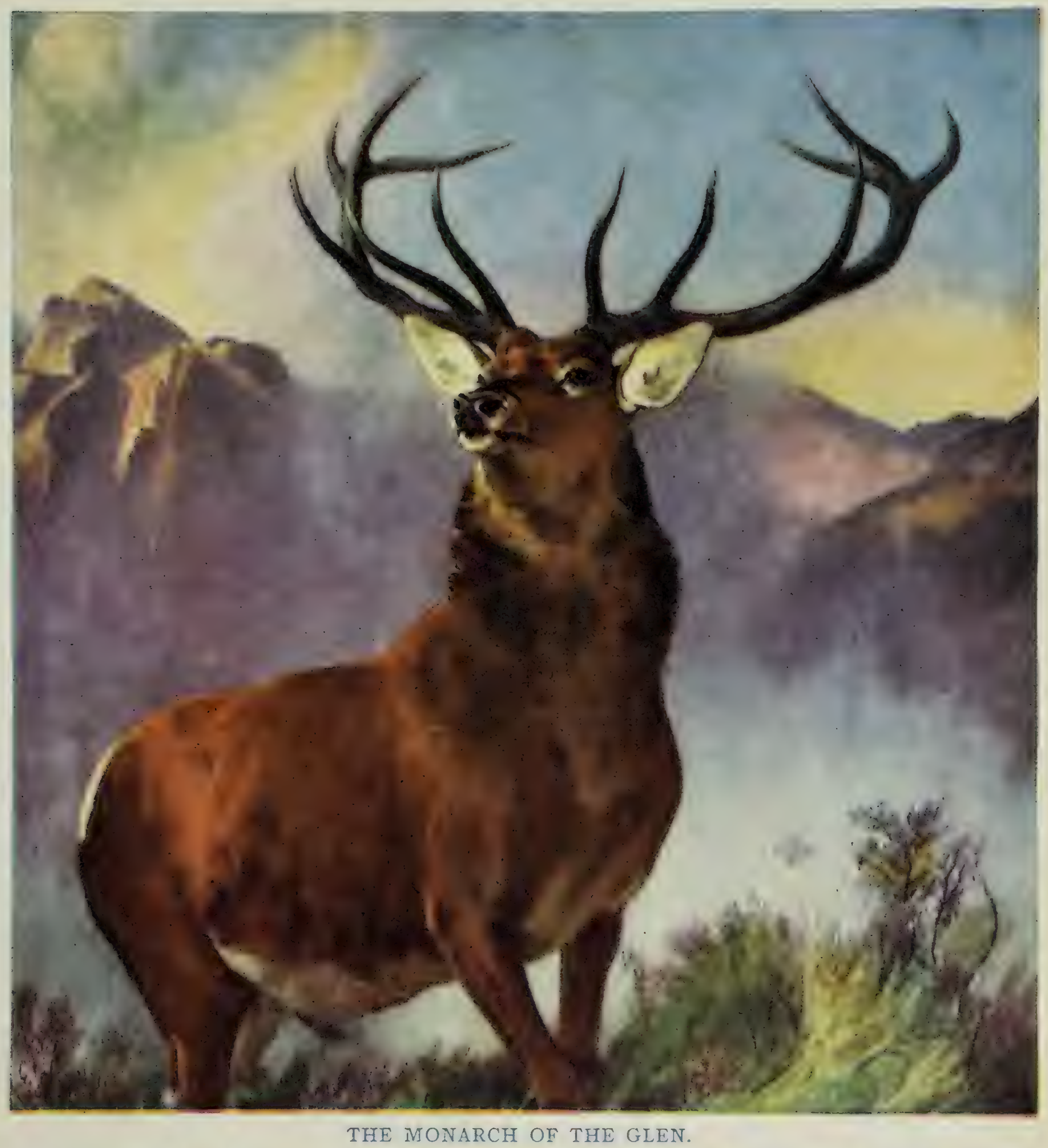
THE SEA-COW IS A HARMLESS CREATURE WITH A PLACID TEMPER.

The Seals and their kind are carnivorous, but there are other mammals who roam the sea pastures in shallow tropical waters and browse placidly on the grass and weed of the under-seas. They are the Dugong and the Manatee, to both of whom the name of Sea-Cow has been given.

The Dugong, the larger of the two, is found only in salt water in the coastal regions of the Indian Ocean, round the shores of Africa, India and Australia and in the Red Sea. Like the Seals he is a warm-blooded, lung-breathing animal with a placid temper; in spite of his



The Seal, whose early ancestors were land animals, is a very musical sea-animal, and loves to bark and sing.



THE MONARCH OF THE GLEN.

On a mountain side the majestic stag stands with ears erect and sniffs the breeze. This is one of the most famous paintings of Sir Edwin Landseer (1802-73), our greatest painter of animals. The massive lions that surround Nelson's Column in Trafalgar Square are Landseer's work. [illegible]

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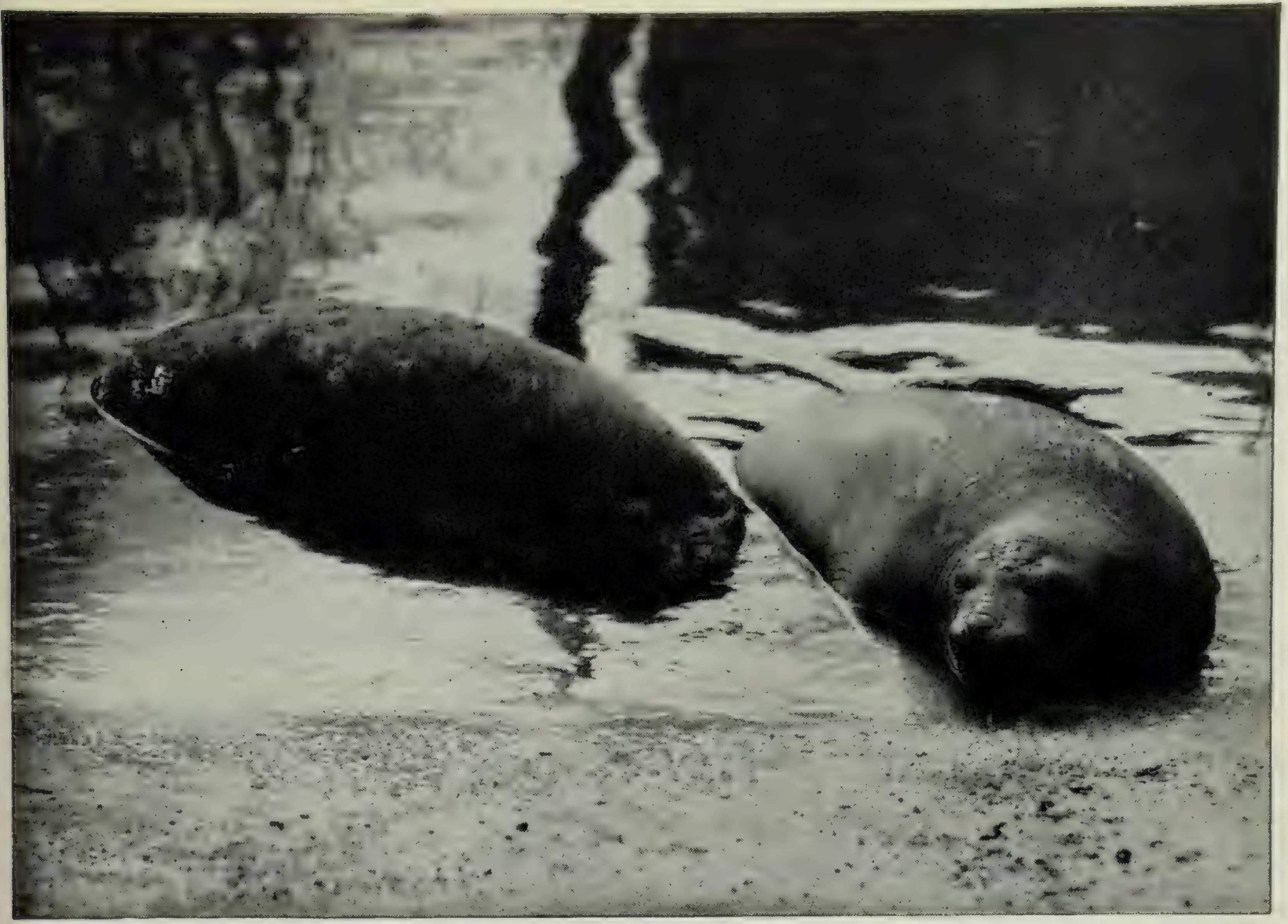
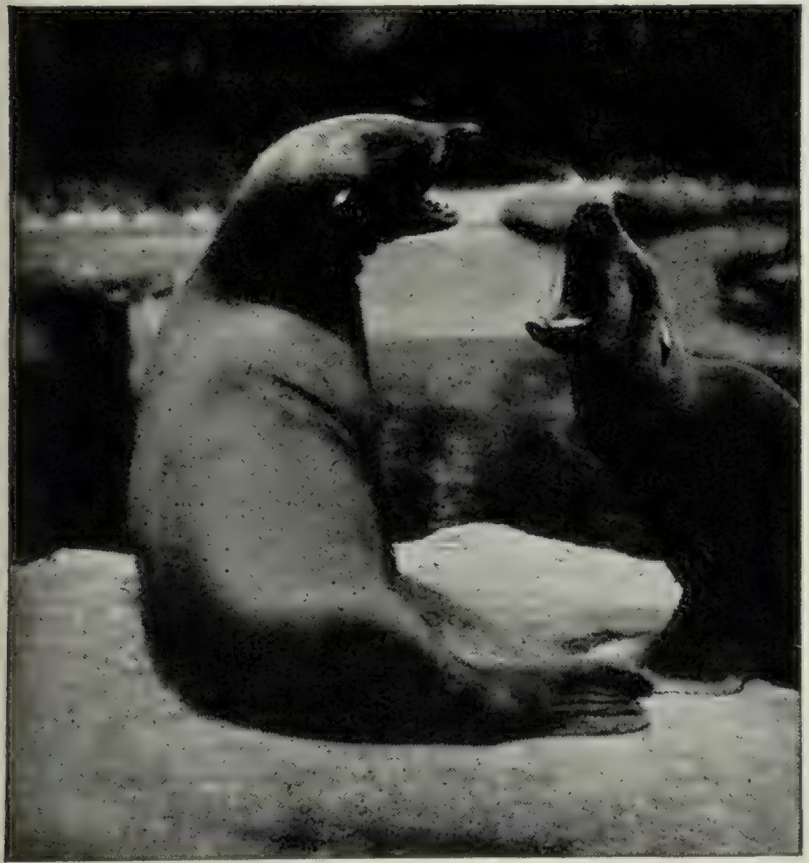


The Sea-Elephant, found in Antarctic waters, is a member of the Seal family. He is of monster proportions, some of his kind being as much as twenty-one feet in length. These great creatures are hunted for their valuable oil.

formidable pair of tusks he is more harmless and inoffensive than the ordinary cow! The Indian species is about ten feet long, the Australian about fifteen feet in length.



Two Sea-Lions practise a duet—or are they wailing for their dinner? The best sealskin is obtained from these great mammals that spend most of their time in the water.

In American waters is the Manatee, up to nine feet long and nearly 600 pounds in weight. He, too, is a gentle bovine beast. Like the Dugong he has big paddle-like fore limbs (three tiny nails the only indication that they ever were toed) and no hind limbs whatever. His fore limbs he uses to stuff food into his mouth! Then his upper lip is divided into two big pads which open and close, and grasp his aquatic food independently of the lower lip. He is fond of the quiet shallow waters of lagoons and river mouths and will ascend the rivers for quite a long distance.

HOW SAILORS IMAGINED THAT THE SEA-COW WAS A MERMAID.

One thinks of them as dull and boring beasts, but a wonderful romantic secret is hidden in their scientific name of *Sirenia.* They are the real sirens and mermaids of the ancient travellers' tales! They hold their young babies in their "arms," or flappers, out of water, when they feed them, and this may have led sailors to think they were "mermaids." But what imaginations the old mariners must have had, to find a beautiful enchantress in the ugly and harmless Sea-Cow!

STRANGE AND CURIOUS BIRDS

A family gathering of Ostriches. They cannot fly, but with their great legs they can cover the ground faster than a swift horse. The kick of an ostrich, which, by the way, is given from the front, is powerful enough to knock a man down. The ostrich eats anything that comes in its way, and has an enormous appetite.

WHAT a number of strange and curious birds there are in our wonderful world!

Some birds have most remarkable bills. There is the Toucan of South America, with a bill which is often nearly as long as its body, giving it a most comical appearance. No one seems to have discovered the use of such a bill, indeed we might think it would be more a hindrance than a help, for the Toucan makes its home in the dense tropical forests. Yet it darts about amongst the trees with the greatest ease, never catching its tremendous bill in a bough, and when it goes to sleep it just tucks its bill beneath its wing, and turns its tail back over its body. It is almost funnier to see it asleep than awake! But when Mother Toucan has some baby birds in her nest in a hollow tree, *then* her bill *is* of use. For she has enemies in the monkeys all around. Does she fear them? No As an old writer wrote quaintly in 1527, "There is no bird secures her young ones better from the monkeys. For when she perceives the approach of those enemies, she so settles herself in her nest as to put her bill out at the hole, and gives the monkeys such a welcome therewith, that they presently (immediately) pack away, and glad they scape so." The bill is not heavy for the Toucan to carry about, being composed of a fine network of bony fibre which makes it strong but light.

Another curious South American bird is the Boatbill Heron. It uses its extraordinarily shaped broad beak as a shovel for gathering up its food, which consists of worms and so on.

The Spoonbill Heron is another bird with the strangest of beaks, long and broad like a spoon at the end.

The Adjutant Stork is one of the most comical-looking birds in the world. It is a native of India, where you may see it eating up waste matter in the streets, and so helping to keep them healthy and clean. No Indian would think of harming an Adjutant, which is a friendly bird, and easily tamed. Just like a funny old soldier it looks as it struts along, opening and shutting its large beak with a loud clapping sound. On land, wading in shallow water and flying through the air, the Adjutant is equally at home. It is about five feet in height.

Its beak is the most extraordinary part of the Pelican, another most comical looking bird, and rather an ugly one when seen on land. It is about the size of a swan, and has white feathers tinged with red. All its plumage is very rough and coarse. It has a large, long and flat upper part to its beak, with a hook at the end curving over the lower part. To the lower part is attached a large pouch, hardly noticeable when empty. But when the Pelican goes fishing in a lake or stream it drops all the fish it catches into the pouch, which expands and is capable of holding a fine catch. When the fisherman has got back to land it then eats the fish at its leisure! When there are young Pelicans about, their mother opens her mouth and the little ones pop in their bills and help themselves to fish from her pouch! The Pelican is graceful in the water, but beautiful in flight. Sometimes thousands of these birds may be seen flying together.

HOW BIRDS CAN MOVE VERY SWIFTLY WITHOUT FLYING.

Some birds cannot fly! Most wonderful of these is the beautiful Ostrich which is found to-day in Africa and Arabia, and is often taller than a man. A full grown bird measures from six to eight feet from the ground. It has only two toes to each foot, but its legs are extraordinarily thick and strong, and it can race along at sixty miles an hour for a long way. Even when it begins to slow down it can outrun a swift horse. The wings of the Ostrich are far too small to lift it into the air, but they help to balance the bird as it runs along the ground.

The Boatbill Heron finds its broad beak useful as a shovel for gathering up its food from the ground. [*F. W. Bond*

The Rhea is the Ostrich of South America. But it has three toes to each foot instead of two, and no tail. Its wings are larger than those of the Ostrich. The strangest thing about the Rhea is its appetite. This curious bird will eat almost anything it comes across, even screws and broken glass, yet it never appears to suffer from indigestion!

THE PECULIAR BIRD THAT MAKES A LOUD SNIFFING SOUND.

Another bird that cannot fly is the Kiwi or Apteryx of New Zealand. It is an odd-looking, plump little bird, with reddish-brown or gray feathers that look like hair. It has practically no wings, and no vestige of a tail, but it has short, thick legs and four toes to its feet. The Kiwi's beak is thick and long, and its nostrils are at the *tip*, enabling it to sniff out the grubs, worms, insects and berries upon which it lives when it goes foraging during the night. For the Kiwi sleeps in the day, but although you might not be able to see it you would easily detect the presence of one in the dark because it sniffs so loudly!

The Toucan is a comical bird whose bill is nearly as long as his body. He uses this bill as a weapon of defence.

THE BIRD THAT CANNOT FLY BUT CAN CLIMB TREES.

The curious Lyre Bird of Australia has the two outer of its tail feathers shaped like the old musical instrument, the lyre, while the finer feathers in between look like the strings! The Bower Bird of the same country builds a little arbour or bower in the spring, and decorates it with any gay objects it can find, flowers, bits of coloured rag, feathers, and so on, in order to attract a mate. The Kakapo or Owl Parrot of New Zealand can actually climb trees like a four-footed animal, although it cannot fly, and the strange Hoatzin of South America can only flutter a little way. It always makes its home in trees overhanging water, and should a baby Hoatzin tumble in it can both dive and swim, and then climb

The long-legged Spoonbill Heron has a queer beak—long and broad and shaped like a spoon at the end. [*F. W. Bond* back to its nest by means of little claws on its wings. But as soon as it is able to flutter these claws disappear, and it also seems to lose the power of swimming. Indeed, a grown-up Hoatzin is rather a helpless bird. It has lost many of its powers through having lived for thousands of years a too easy, sheltered life.

Perhaps strangest and most curious of all the birds are the Penguins. Comical, indeed, they look, waddling along on their short legs with their paddles hanging down straight and stiff by their sides. These paddles are all that remain to the Penguins of the wings which their ancestors had thousands of years ago. They are of no use at all to fly with, but once in the water they enable the penguin to swim faster than any other bird. Penguins are chiefly found in the south, where they frequent the shores of rocky islands and the great Antarctic continent. They are companionable birds, and in the mating season they gather together in vast numbers upon the cold beaches and there build their nests of pebbles and hatch out their young. It is a hard existence, and from one accident or another some of the young Penguins always die, whereupon the disconsolate parents set off to steal some other family's chick. The result is often a pitched battle, during which the poor little fledgling more often than not gets killed by its too affectionate elders in their efforts to gain possession of it. Such little Penguins are truly killed by love.

BIRDS OF PREY

SOME of the most wonderful of all the birds are the birds of prey, and the most splendid of these are the Eagles.

The finest Eagle is the Golden Eagle, a magnificent creature with feathers of a rich golden brown, the golden colour near the tips of the feathers giving a golden appearance to the whole bird. It makes its home far from the haunts of men, high up on the mountain sides in Scotland, and thither it carries in its strong talons the rabbits, hares and small birds it has killed as food for its little ones. A Golden Eagle is so strong and fierce it can kill and carry off a lamb or even kill a young deer.

THE EAGLE THAT STEALS FISH FROM OTHER BIRDS.

The Sea-Eagle is the largest of the Eagles. In Scotland, the islands to the north, and in the wild parts of Ireland, it is chiefly found. This Eagle drops down from the air upon birds and small animals like the Golden, but it also often pounces suddenly down into a lake or river or the sea upon a fish its sharp eyes have espied from above.

It can even *swim* in the sea!

The Sea-Eagle will sometimes rob the Osprey of a fish. For the Fishing Hawk, as the Osprey is also called, flies over the sea in search of its prey, which is only fish. It is a handsome bird, and it is a fine sight to watch one in its graceful flight over the ocean. It fishes, also, in rivers and lakes.

The Ospreys of North America fear the great White-Headed Eagle of that continent, which, although very fond of fish, is no fisherman, and takes every opportunity of pouncing down and snatching away a fish that an Osprey is carrying to its nest.

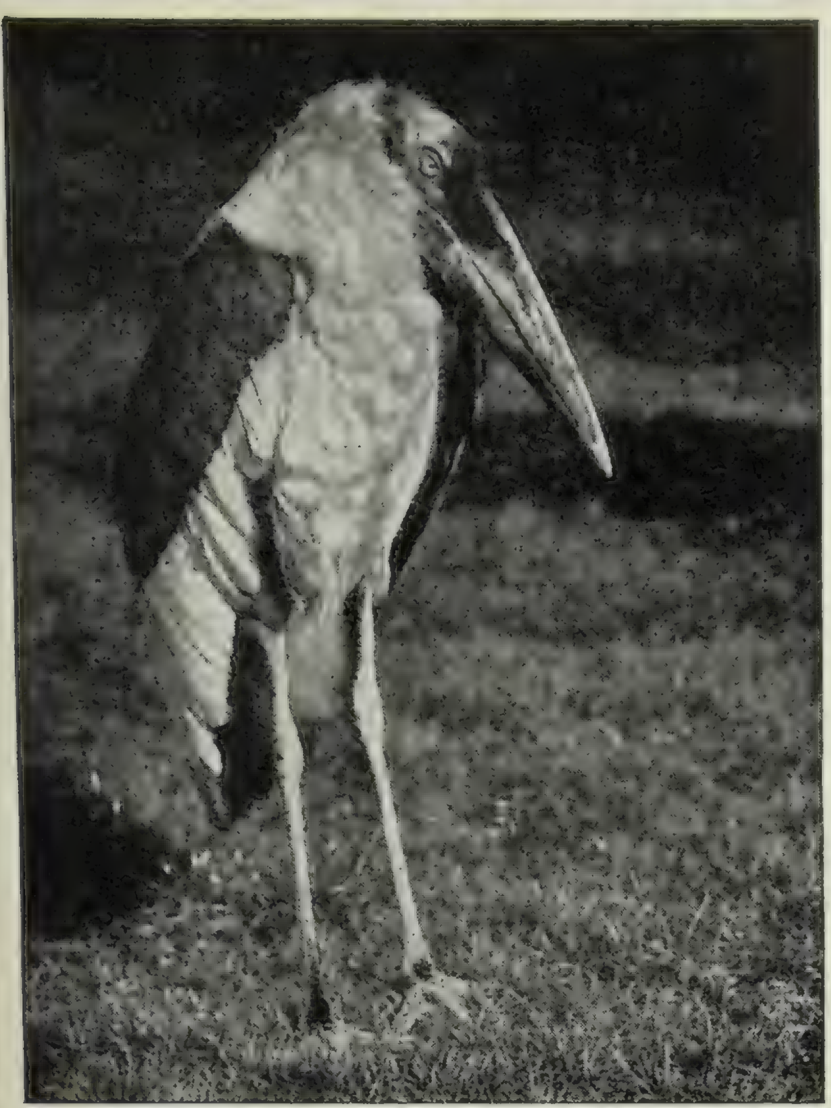
Of Vultures there are several kinds. Most wonderful is the Condor, the largest of all the Vultures, and, indeed, of all the birds of prey. The great male bird is about four feet long, and when its wings are spread out they measure from eight to eleven feet or more across from tip to tip.

To see a Condor in flight is a wonderful sight. It is like watching a yacht sailing through the air, so graceful are its motions. Thousands of feet up amongst the Andes in Chile and Peru the Condor builds its large nest, and so marvellous is its eyesight that from these tremendous heights it can see an animal being killed or dying in the plains and valleys far below, and suddenly drop down upon it like a stone directly it is dead. For, although such large birds, Condors have not strong enough claws to carry off an entire animal like the Eagles.

THE BIRD THAT IS PROTECTED BY LAW BECAUSE OF ITS USEFULNESS.

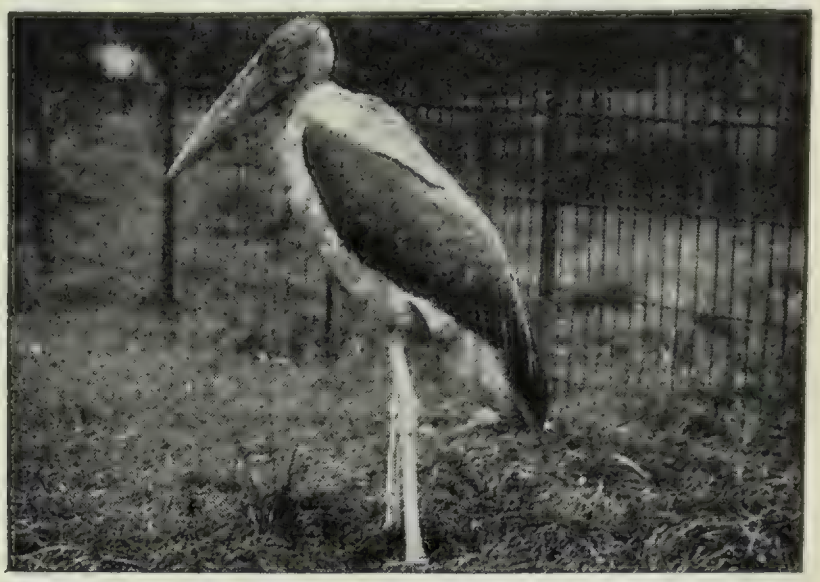
The King Vulture is a strange-looking fellow with the flesh of its bare neck brightly tinted with shades of orange, crimson and purple. The Lammergeier or Lammergeyer Vulture, which may be seen soaring over the Alps in Italy, the hills of Spain and the Caucasus Mountains, is much handsomer. In fact it is quite a splendid creature. Its feathers reach right up to its beak, and have somewhat the appearance of a beard, hence its other name of the Bearded Vulture. The Griffin Vulture,

IT TAKES ALL KINDS TO MAKE A WORLD!

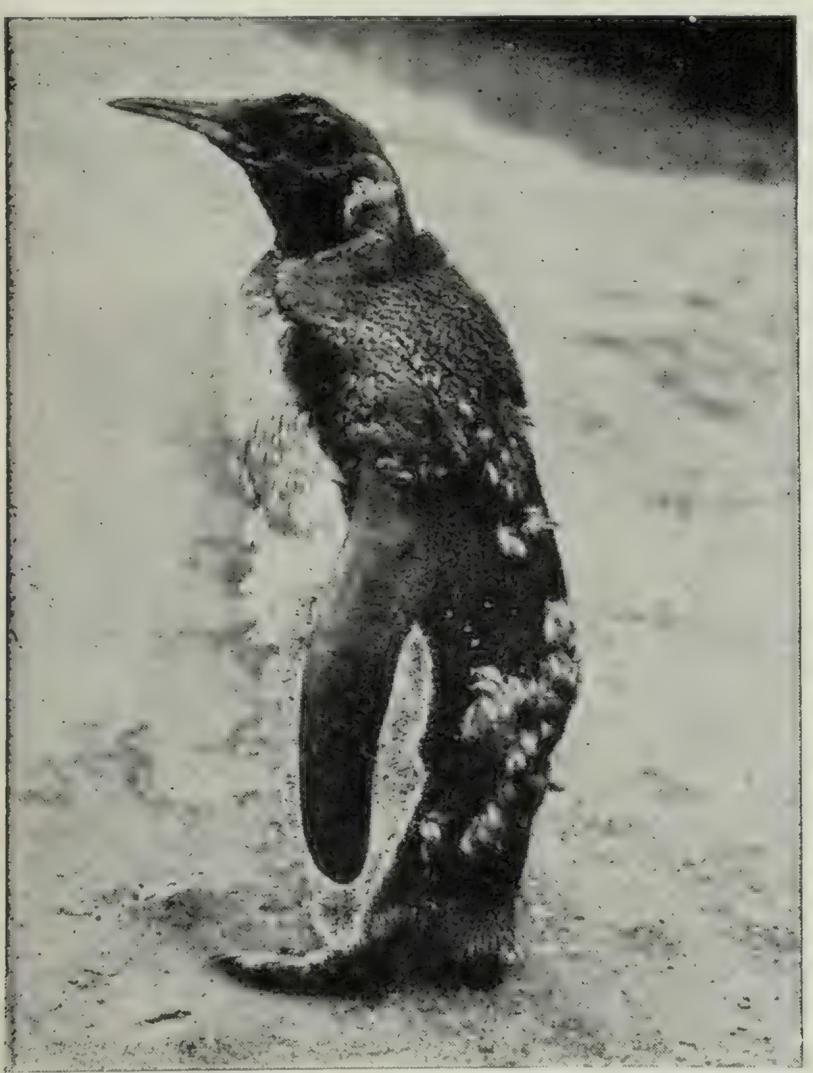


The Marabou Stork—a large and ugly bird with an almost bald head—looks peculiar with his long legs and humped back. He is a native of Central Africa. [*F. W. Bond*

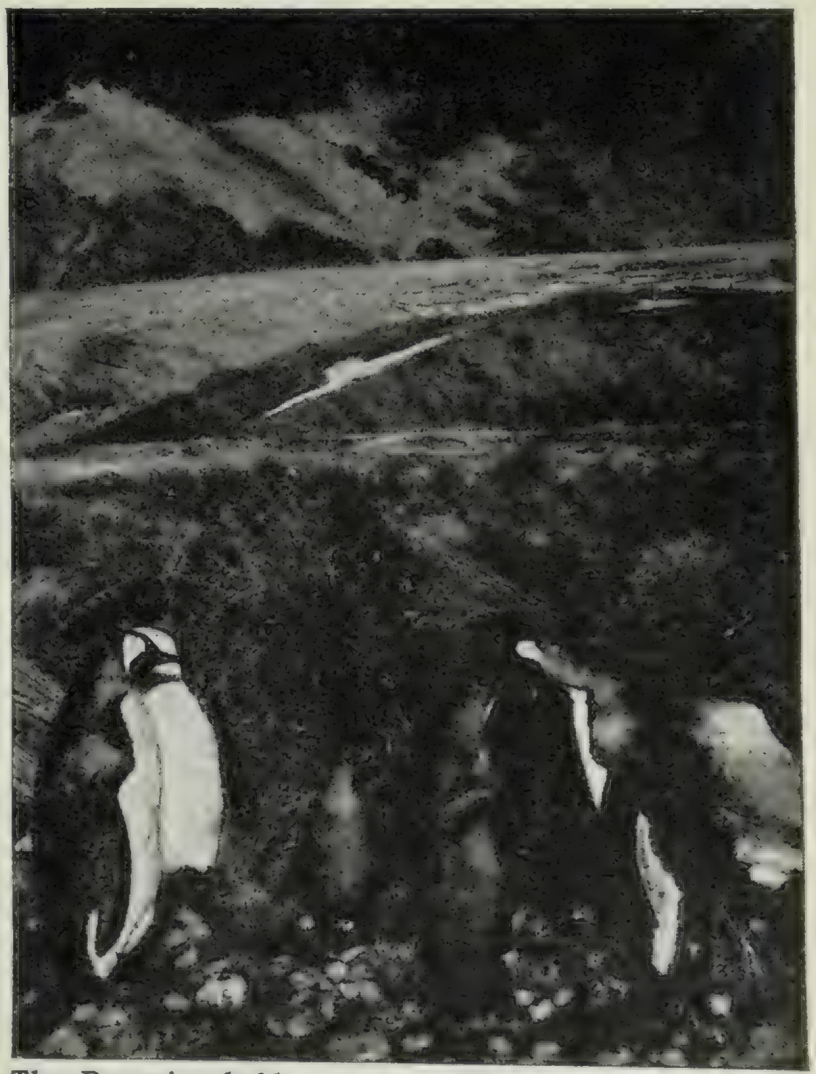
The White Pelican carries food in a pouch in his neck.



The Adjutant Stork is a native of India, where he acts as a scavenger, cleaning up waste matter in the streets with his great bill. His wings measure 15 ft. from tip to tip.



The King Penguin—in the moulting stage—waddles along the sea-shore. Long ago his ancestors had wings in place of the paddles which he uses only for swimming. [*F. W. Bond*



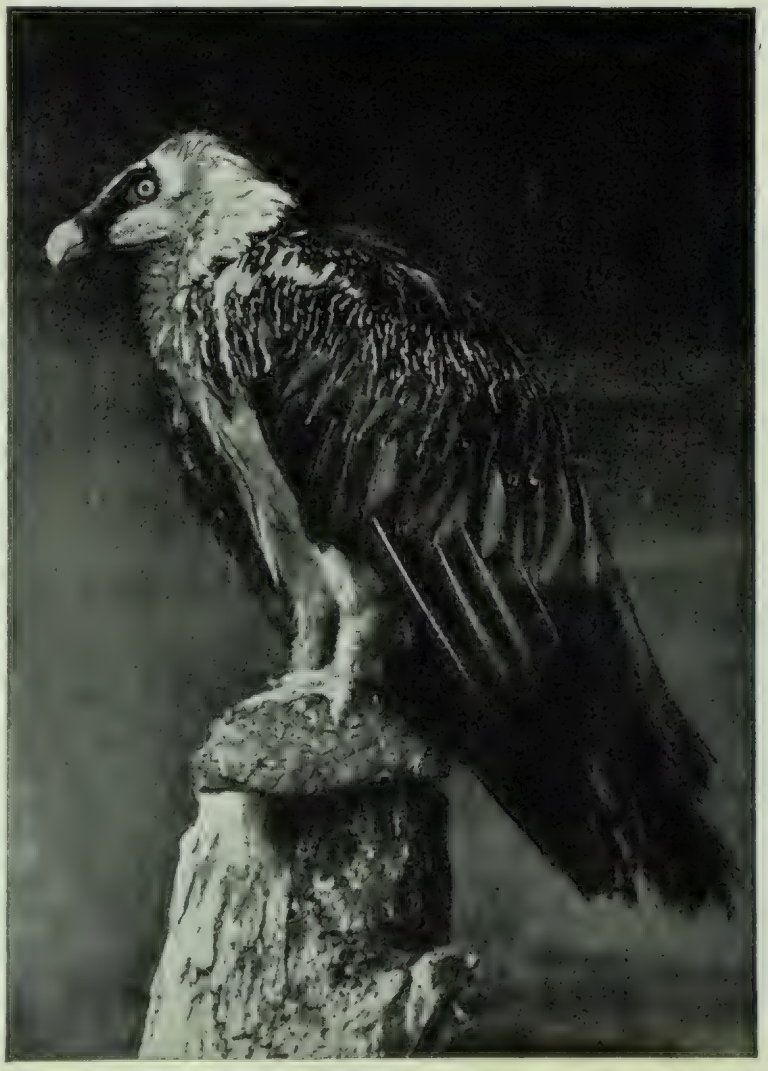
The Penguins hold a party on shore, strutting about in comic attitudes while they talk together in their own language. They can swim faster than any other bird.

The great Condor—the largest of the American vultures, feeds on carrion, attacking goats, lambs and young calves.

The Buzzard, another bird of prey, is one of a large family of twenty species. It feeds on rabbits, birds and reptiles.

which looks rather like a griffin, is found in parts of Europe and in Eastern countries. In many of the latter, Vultures are protected by law because they are so useful as scavengers. In Egypt they are known as Pharaoh's Chickens, and you will see many carvings of this bird upon the ancient tombs and monuments of that land. To the ancient Egyptians the Vulture was the emblem of the love of parents for their children, for Vultures generally are the best of parents themselves.

The Buzzard is another magnificent bird of prey and one of the handsomest of the great Falcon family, which includes some three hundred species, and of which the Eagle is the king. It is found chiefly amongst the Welsh mountains where it is protected, and here you may often hear its loud " mewing " far above you, and watch its silent flight, silent because its downy feathers make no sound. The Peregrine Falcon is another very handsome bird, as is also the Merlin, the smallest of the Falcons. There are the Jerfalcon, the Barbary Falcon, the Hobby, the Lanner, and the Indian Shaheen, all of which have beautiful long wings and dark eyes, and the habit of rising high up into the air from which they suddenly descend like thunderbolts upon the prey they have espied beneath them. The Sparrow-Hawk and the Goshawk have shorter wings and their eyes are yellow. They catch their prey in a different manner, by pursuing smaller birds in the air, in a straight line. When you hear a great commotion amongst sparrows and other birds, you may often see that a Sparrow-Hawk is the cause.



The Lammergeier—a large bird of prey—lives among mountains and feeds mainly on carrion. Its enormous wings are over nine feet in expanse. (*F. W. Bond*

The Kite, with its black, brown and reddish feathers and its forked tail like a swallow's, was once very plentiful in England, and was very useful as a scavenger in London before that city had any real sanitation, for it kept the streets clean and healthy by eating up the refuse that people used to throw out of their houses. To-day it is very rarely seen in this country.

Of smaller birds of prey, there is the Owl which, in this country, only hunts at night. In the full glare of daylight it is completely dazzled, but when darkness has fallen its marvellous eyes can see quite well, and an Owl can pounce down from the air upon a mouse or rat or mole moving through a field beneath it, which we should be unable to see if we were quite close. An Owl's eyes are peculiarly placed close together in front, but this defect is remedied by its being able to turn its head very easily in any direction, so that its eyes are quite useful.

The Hawk-Owl can see and goes hunting by day. The great Eagle-Owl is so strong and fierce that it will even attack a man or the large Golden Eagle.

The Raven, a member of the Crow family, is an amusing bird—always ready for mischief. The Carrion-Crow and Shrike, or Butcher Bird, are other small members of Nature's cruel but wonderful tribe of birds of prey.

In olden days when hawking was a popular pastime, Falcons were kept as pets and trained to hunt prey for the amusement of the lords and ladies. [*F. W. Bond*

SOME USEFUL BIRDS

WE are rather inclined to take birds as a matter of course, to look upon them as pretty, useless things; yet there are numbers of birds which are of great service to mankind, and which we should soon begin to miss in all sorts of ways if they were suddenly to disappear. Some of these birds are tame, some serve us in their wild state, and of the former perhaps the most useful of all is the common Farmyard Fowl.

There are dozens of breeds of fowls. Some are much bigger than others; some are good layers—it is from these breeds that we get most of the eggs we eat—but are not good at sitting, whilst yet other breeds become broody very easily, and can be persuaded to sit on the eggs of other breeds and hatch them out. Though tamed most fowls are very savage. Cocks will fight each other until one is killed; a mother hen will peck strange chickens to death, and even little chicks will attack strangers of their own size which are put into the same run with them.

The Cormorant is such an expert diver that in Oriental countries it is trained to catch fish. [*F. W. Bond*

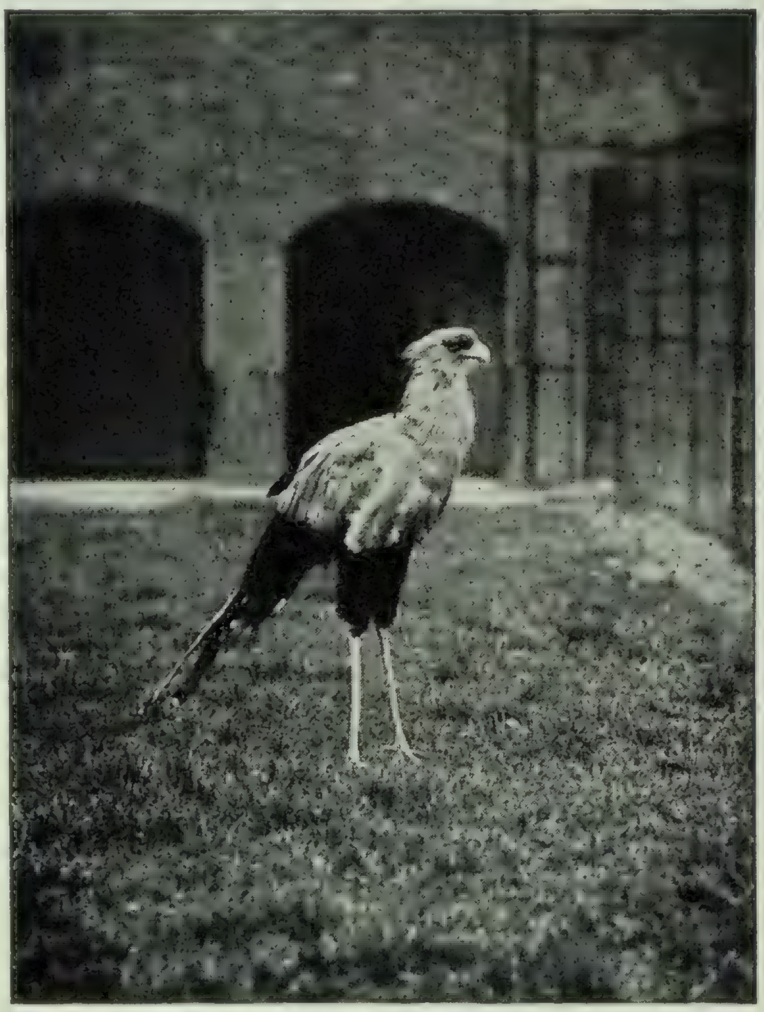
THE USEFUL BIRD THAT PROVIDES US WITH SOFT DOWN.

Ducks also yield us eggs, though they are not especially bred for this purpose like chickens are. Some of the wild Ducks are very curious fellows. There is one species called the Whistling Teal which builds its nests in trees. There the young are hatched, and when it is time for the ducklings to leave the nest the parents give them a ride down to earth on their backs, or carry them in their claws. Another curious duck is the Sheldrake. It is also called the Burrowing Duck because of its habit of crawling down into rabbit-burrows and there laying and hatching out its eggs.

But perhaps the most useful duck, so far as we are concerned, is the Eider-Duck. The female of this breed has a beautiful soft down upon her breast, and when the time arrives to build the nest she plucks off this down with her beak and lines the nest with it, so making a warm, cosy home for her little ones. Men collect this down and make it into quilts or "eider-downs" which we spread on our beds to keep us warm during the cold nights of winter. Swans are useful in very much the same way, and it is from their soft under-plumage that we get swan's-down from which ladies' powder-puffs and many other similar articles are made.

THE BIRD THAT IS TRAINED TO DIVE INTO THE WATER TO CATCH FISH.

The Cormorant serves man in a different fashion, but British fishermen hate it, for it is an insatiable fisher, and robs them of great quantities of good fish, but in China they have taken advantage of the cormorant's skill as a fisherman, and have trained the bird to fish for them. With two or three trained birds the Chinese fisherman sets forth on his raft upon the river or lake, and no sooner does a bird espy a fish in the water than it plunges in and catches it in its strong beak, and brings it to the fisherman waiting on the raft above. When first trained these fishing Cormorants have a ring fixed round their necks to prevent them from swallowing the fish they catch, but a fully trained bird will not need a ring, and will take the fish it catches to its master without attempting to swallow it. An easy way of fishing, is it not?


The Secretary Bird, an African bird of prey, derives his name from the long feathers that look like quills thrust behind his ears. He looks like an eagle with long legs. [*F. W. Bond*

In Australia they have a bird which is called the "Settler's Clock" because it always calls at dawn and dusk. Its real name is the kookaburra, and it is a cheery bird for its call is something like a merry chuckle, and no sooner does one Kookaburra begin to laugh than all the other Kookaburras in the neighbourhood join in. No one in Australia ever intentionally kills a Kookaburra, for, besides being such a cheerful companion, it kills lizards and poisonous snakes, and so renders a real service to the people amongst whom it lives.

THE LAW PROTECTS THIS GREAT BIRD BECAUSE IT KILLS SNAKES.

Killing snakes is also the chief employment of the African Secretary Bird, which in looks is something like an Eagle with very long legs. It has little power of flight, but its stilt-like legs carry it very rapidly over the ground, and so great is the number of snakes one bird will kill in the course of a year that no one is allowed to hunt it, and it is protected by African law from molestation. Legal protection is likewise extended to the Carrion Crow in some parts of the world. In the case of the Crow, however, the service rendered is not killing snakes, but that of a street scavenger who eats the carrion and garbage which litter the streets of the towns.

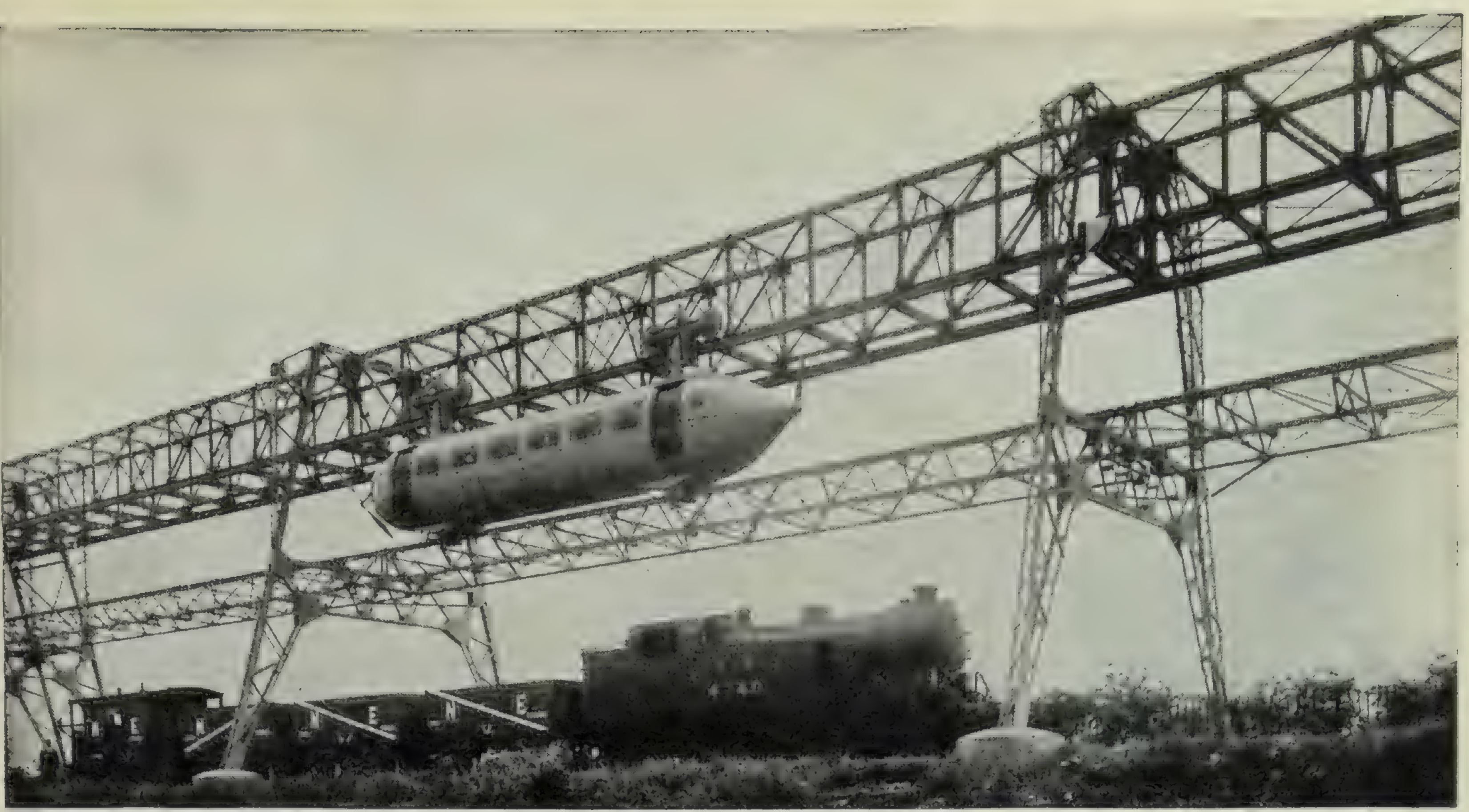
HOW HOMING PIGEONS CAN BE SENT WITH MESSAGES.

Probably at some time or other you have seen large crates of Pigeons being unloaded from a train. These Pigeons are known as "Homing Pigeons," and so great is their intelligence or instinct that, though they may be sent hundreds of miles away from their homes, yet, when released, they will rise in the air and fly straight back to where they came from. Such birds fly at immense speeds, sometimes reaching more than a mile a minute, and they will fly for hundreds of miles without resting. In Great Britain and many other countries annual pigeon races are flown, whilst this homing instinct of the bird is used in times of war and peace to send messages from one place to another.

HOW BIRDS CAN BE VERY USEFUL TO THE FARMER.

Birds also serve us by eating the grubs and insects which would otherwise destroy our crops and fruit. Jays, Swallows, Titmice, Flycatchers, Nuthatches and many others are all useful in this way, and farmers are careful not to kill them, knowing that if they do so their crops will suffer.

Then there are birds such as the Nightingale, the Lark, the Blackbird, and the Thrush which are useful simply because of the pleasure we derive from their singing. It would be a dull world if there were no pleasure in it, and those birds which delight us with their beautiful singing are just as useful in their way as those which kill snakes and grubs or do any of the other useful things which birds do for mankind.



In a very short time, perhaps, we may be travelling above the railway by this new and fascinating Railplane method.

NEW TRANSPORT WONDERS

Nowadays new wonders of mechanical genius constantly appear, and it would be hard to foretell how you will travel when you grow up. Here are shown to you two new types of transport—one already in public service, and the other being tried out. Both depend on new methods of propulsion. One works like an aeroplane, and the other like a motor-car.

TUCKED away beyond the rush and bustle of the city of Glasgow, near the beautiful Lennox Hills, is the little town of Milngavie, and in a field as we near this beautiful gateway to the hills we see something that certainly makes us look again, then pause and rub our eyes. For there, built over a length of ordinary railway line, is a sturdy framework of steel girders, a tiny station high above the earth, and—most wonderful of all—a cigar-shaped carriage with propellers at each end.

Let us climb the steps to this fairy-like station and examine this new thing. We arrive at the platform and look on a long carriage, glistening white, and with curtained windows along both sides. In front and behind, at the pointed ends of this white cigar, are four-bladed propellers, like those that drive our aeroplanes high into the clouds—and above.

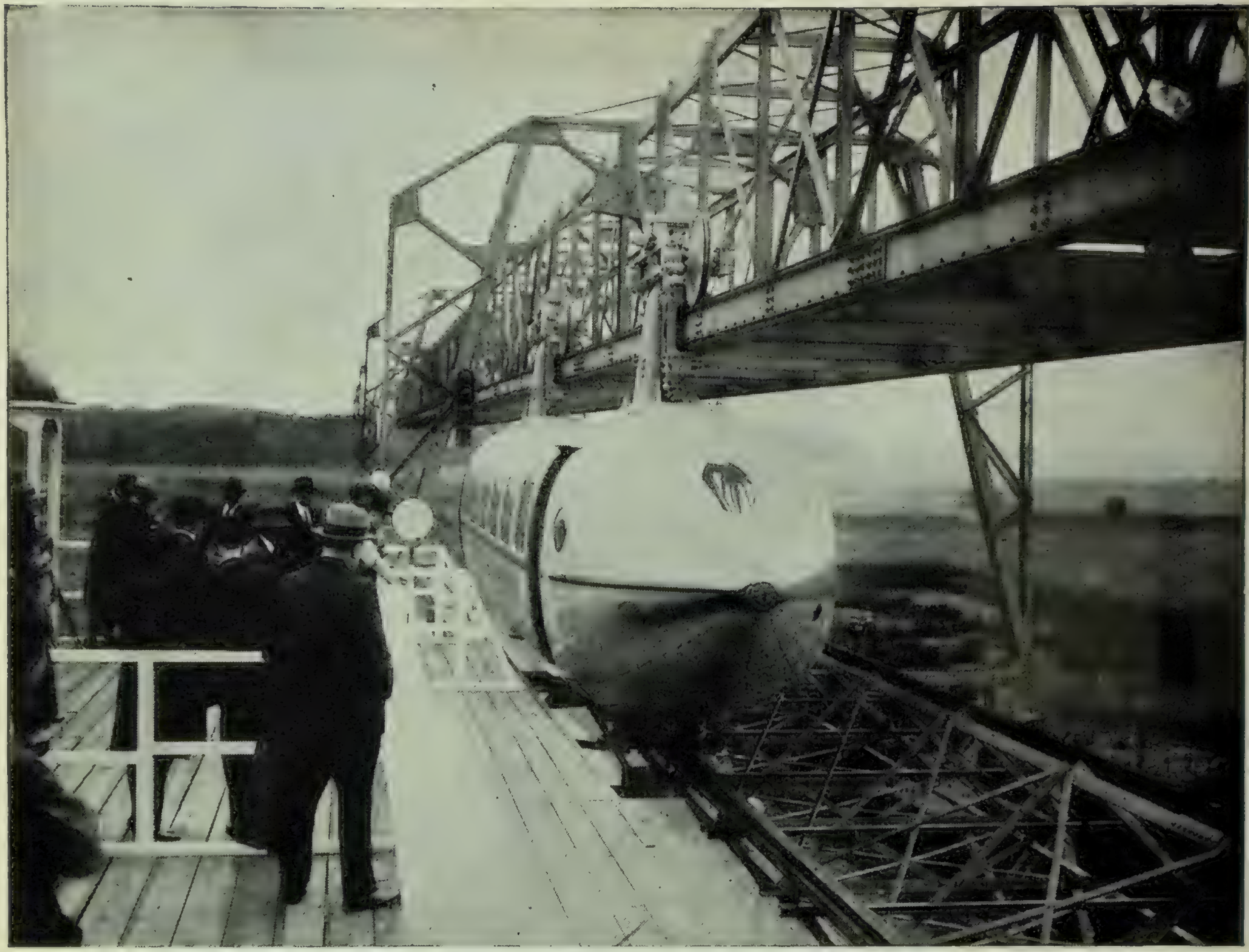
HOW THE RAILPLANE CAN BE HUNG IN THE AIR ABOVE THE RAILWAY.

But how does this graceful carriage of the future stay up in the air? We notice that, fore and aft, on the top are arrangements of springs and wheels, two wheels at each end of the carriage. These wheels are grooved, and they rest on a narrow rail that runs above the coach the whole length of the track. The coach, then, is suspended from above—and not, as in the case of a railway coach, resting on wheels below.

INSIDE THE AIR PALACE THERE ARE LUXURIOUS CARS FOR THE PASSENGERS.

Under the coach, however, are horizontally placed wheels, gently caressing a stout steel bar—a wheel on each side. These wheels, the chief engineer informs us, are there to keep the car steady as it rushes along, drawn through the air by its whirling propellers, at a speed of 100 to 120 miles an hour. Each horizontal wheel is allowed some six inches of "play" so that there is no grinding, no braking—no force when the wheels meet the bar. They just keep the car steady—and when it starts up the passengers only notice the fact that they are moving by gazing out of the window at the objects of the countryside, rapidly flying past this greyhound of a coach.

But let us enter and take a seat. The door, with its tasteful stained-glass oval window, slides noiselessly back and we enter a wonderfully appointed long coach. A thick carpet runs down the centre and on each side are the most comfortable easy-chairs it is possible to imagine. Electric lights run along the length



Time up! The Railplane leaves the station at Milngavie to begin a swift skimming journey through the air.

of the coach, and table lamps are cunningly introduced on semi-circular ledges between the chairs. This railplane—or to give it its full name, taken from that of the inventor—this George Bennie Railplane, is not like a train or a road-coach. It is like home or an expensive club.

IN THE DRIVER'S CABIN EVERYTHING IS BUILT FOR SAFETY.

As there is no feeling of bumping over badly-set rails, no shunting of carriages, no smoke or shrieking of whistles—a ride in this coach is a sheer delight. It is travelling without knowing it, almost.

Come, peep at the driver's cabin. Not much to see here, for the whole affair is so neat and compact. There is a powerful electric motor to drive the shaft that rotates the propellers, and a window in the nose of the coach gives the driver a clear view of his track. The double braking system is so cleverly designed that should there be danger ahead—and the green, orange and red light signals are in the coach, on the motor, and not outside on the track—the brakes are automatically applied. As the propeller slows down on approaching the station, a motor in the rear of the car sets the aft propellers rotating in an opposite direction to that of those in front. Thus the very air itself is made to act as an efficient brake.

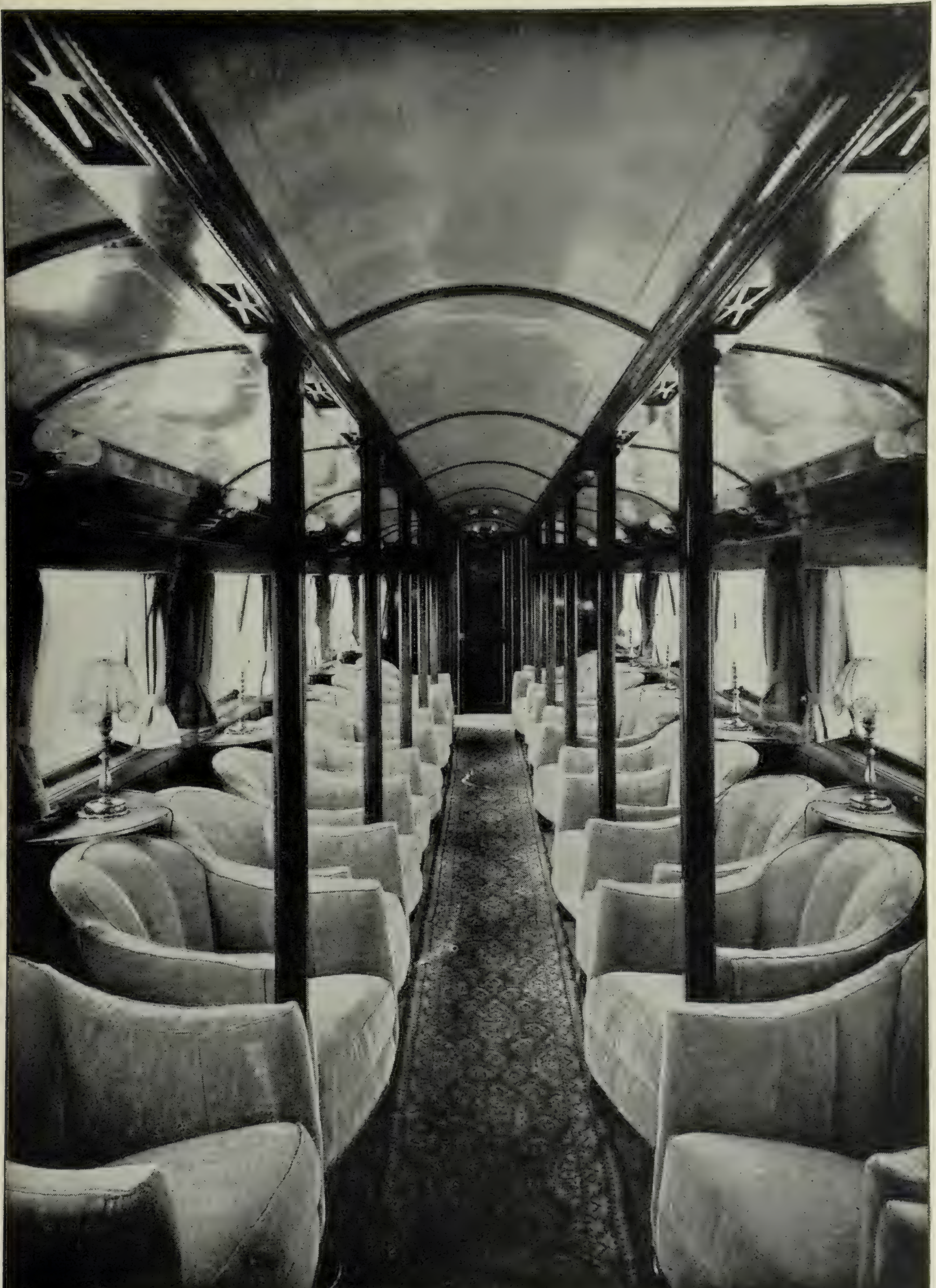
Then there are brakes acting in the column that join the car to its overhead wheels.

The railplane, then, cannot jump its rails, for the weight of the coach and passengers ensures its stability. It cannot sway from side to side, as the under-wheels correct this. Its brakes are so designed as to be foolproof—and there can be no collision with other traffic. So here is a marvel of British engineering—a safe, joyous and speedy means of transport. What is its practical use ?

DO YOU EVER THINK HOW MUCH MONEY IS SPENT SO THAT YOU CAN ENJOY TRAVEL BY RAIL ?

Did you know how much it costs per mile to lay a double railway track of the kind we all know ? The cost is from £45,000 to £60,000 per mile. Even a double tramway track costs from £25,000 to £30,000 a mile. The tubes in London, laboriously tunnelled through clay,

THE COSY INTERIOR OF THE RAILPLANE



How would you like the sensation of skimming through the air, above the railway? In the comfortable passenger-car of the Railplane travel becomes a luxury. It is safe, speedy, and the motion is scarcely felt.

gravel and rock cost £800,000—over three-quarters of a million pounds per mile.

WILL WE EVER ADOPT THIS CHEAP AND SAFE METHOD OF RAIL TRAVEL?

To lay a double track for the railplane costs £19,000 a mile. So, if a new line were to be laid, double track, to join two towns twenty miles apart it would cost £820,000 less than would an ordinary railway line. No "permanent way" has to be laid down.

Then the railplane line may be erected over existing railway tracks, and used for express passenger traffic. It can cross roads and streams, or go up small hills where a railway would need bridges and tunnels—both costly things. And it would travel at more than double the speed of the passenger train, with less wear and tear and at a much less cost.

The power may be supplied either from a live electric rail running on a track beneath the car, or by petrol engines in the driver's cabin. There is no stoking of coal and stopping to pick up water.

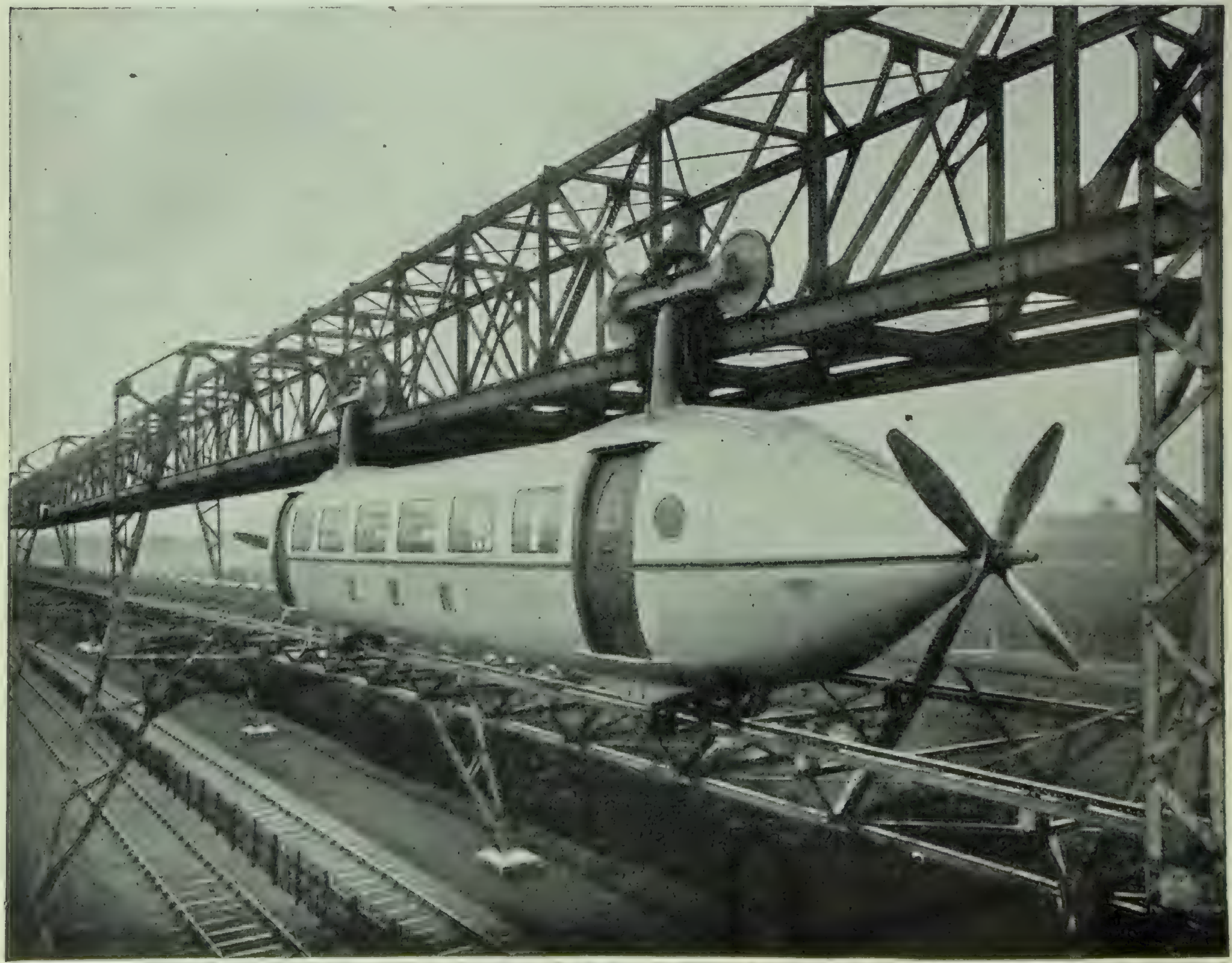
The coach is stream-lined, to offer the least resistance possible to the air, and altogether this wonderful product of British brains and hands is worthy of universal use and support.

Will it ever become a real thing in our lives? Shall we half-ride and half-fly above the earth in a railplane? Perhaps before you are much older you will see these slender yet firm and rigid pillars rise in field and over railway track, and be able to take your ticket and tear through the air like a rocket—without vibration or danger.

WILL THE RAILPLANE BECOME MORE WIDELY KNOWN IN THE NEAR FUTURE?

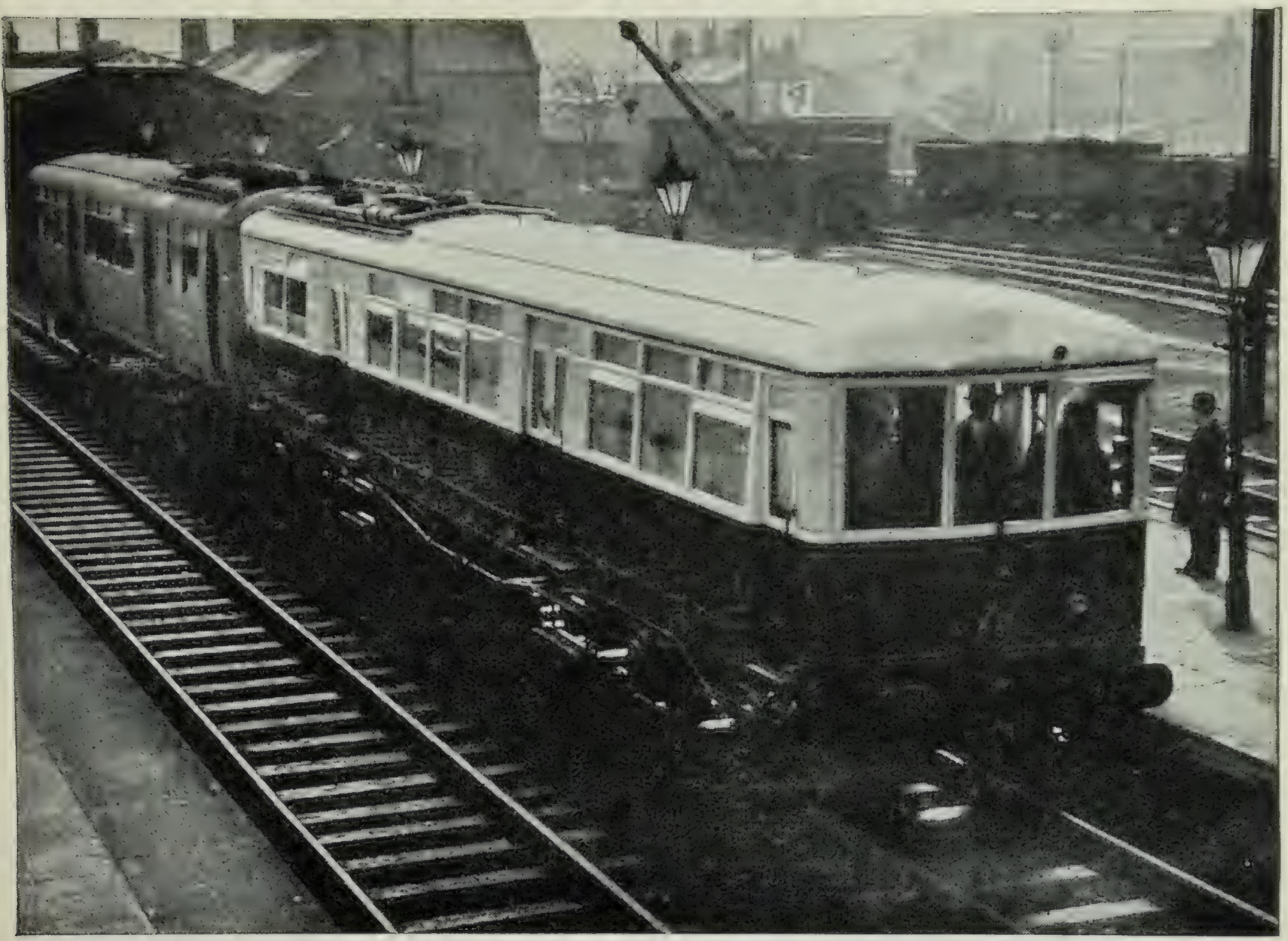
Perhaps one day rivers may be spanned by railplane bridges and roads may see the graceful pylons carrying the network of tracks from town to town across them.

Up to the time of writing there is nothing in the world like the railplane that waits at Milngavie to prove its worth—and clever engineers are planning and working to show the world the new, cheap, safe and very comfortable twentieth century method of travel without tears.



Perhaps in the near future we will climb into the Railplane when we want to travel by a swift and safe method.

A DIESEL-ENGINE OIL-ELECTRIC RAIL CAR



New oil-electric cars are finding their way over the rails to-day, and the "Tyneside Venturer," which carries forty passengers, has proved that this method of rail-travel can be very inexpensive. On the journey between King's Cross and Hertford, the cost of oil consumed amounts to only 1s. 1d. The photograph shows the coach on test at Newcastle.

MANY motorists have long dreamed of what they would do if they could only put flanged rail wheels on their cars and race along the smooth prepared permanent way tracks of the railways in between the express trains. Early in the development of the internal combustion engine, which obtains its power from explosions, inventors and engineers tried to adapt it to work railway trains, but the broad highway and broad rubber tyres which enable light motor-cars to grip and hold the roads are not at all like the smooth railway metals, and it was quickly realised that a motor-car on rails would have to be powerful and would use up an amazing amount of petrol. Internal combustion oil engines were next thought of, and a useful trial railway locomotive working on this principle and developing 1,000 H.P. was built for the German Railways as long ago as 1912.

But the oil-engine locomotive was not altogether a triumph, because of the difficulty of obtaining enough power just when it is most needed by a railway train, on starting. Many different types of internal combustion oil engines were fitted into rail carriages by engineers all over the world, but most of these were excessively heavy and cumbersome, and were merely engines built for other purposes fitted on to railway wheels.

Side by side with this progress, the makers of electrical dynamos and motors, whose first designs were complicated and weighty, produced simpler and cheaper equipment to help the oil engine experts, and as lighter oil engines were made for aircraft it became possible two or three years ago to experiment with a railway locomotive and self-contained rail-carriage which was really an effective power station on wheels. An oil engine, started up by electricity in the same way as a car, was made to transmit its energy to a dynamo, and in turn the electricity so manufactured was fed to electric motors which turned the wheels.

Thus the oil-electric rail car became of real value to the railway engineer. Some engineers believe that the rather expensive electric drive which is the latest form of transmission of power to the wheels of such a locomotive or carriage is not the last word in the application of internal combustion oil engines to railway trains, but there seems no alternative but to carry the whole of the machinery about if the full benefits of fast acceleration are to be secured.

HOW A TRAIN IS DRIVEN AT THE HIGH SPEED OF NINETY MILES PER HOUR.

Driving a rail car of the latest type, such as is being run by the L.N.E.R. and L.M.S.R., is something between driving a tramcar and a motor-car. The driver presses a button to a self-starter. This makes the oil engine purr away—almost instantly it is able to make enough electricity to propel the car, and by a control handle similar to that which the tramcar driver works the desired speed is obtained.

Power pneumatic brakes bring the car to a standstill when required, and a "dead man's" safety handle on the control lever stops the train if the driver should become ill and lose control. A British oil-electric rail car can run five miles to a gallon of oil, and 400 miles without refilling. As soon as the engine is shut off the car may be safely locked up and left, and there is no getting up steam.

Very high speeds have been accomplished by these new power units of the rails. In Germany the new "Flying Hamburger"—a double rail car which is running between Hamburg and Berlin—touches speeds of 90 miles an hour, and the British rail cars, "Tyneside Venturer" and "Northumbrian," travel at 65 miles an hour where it is safe to do so.

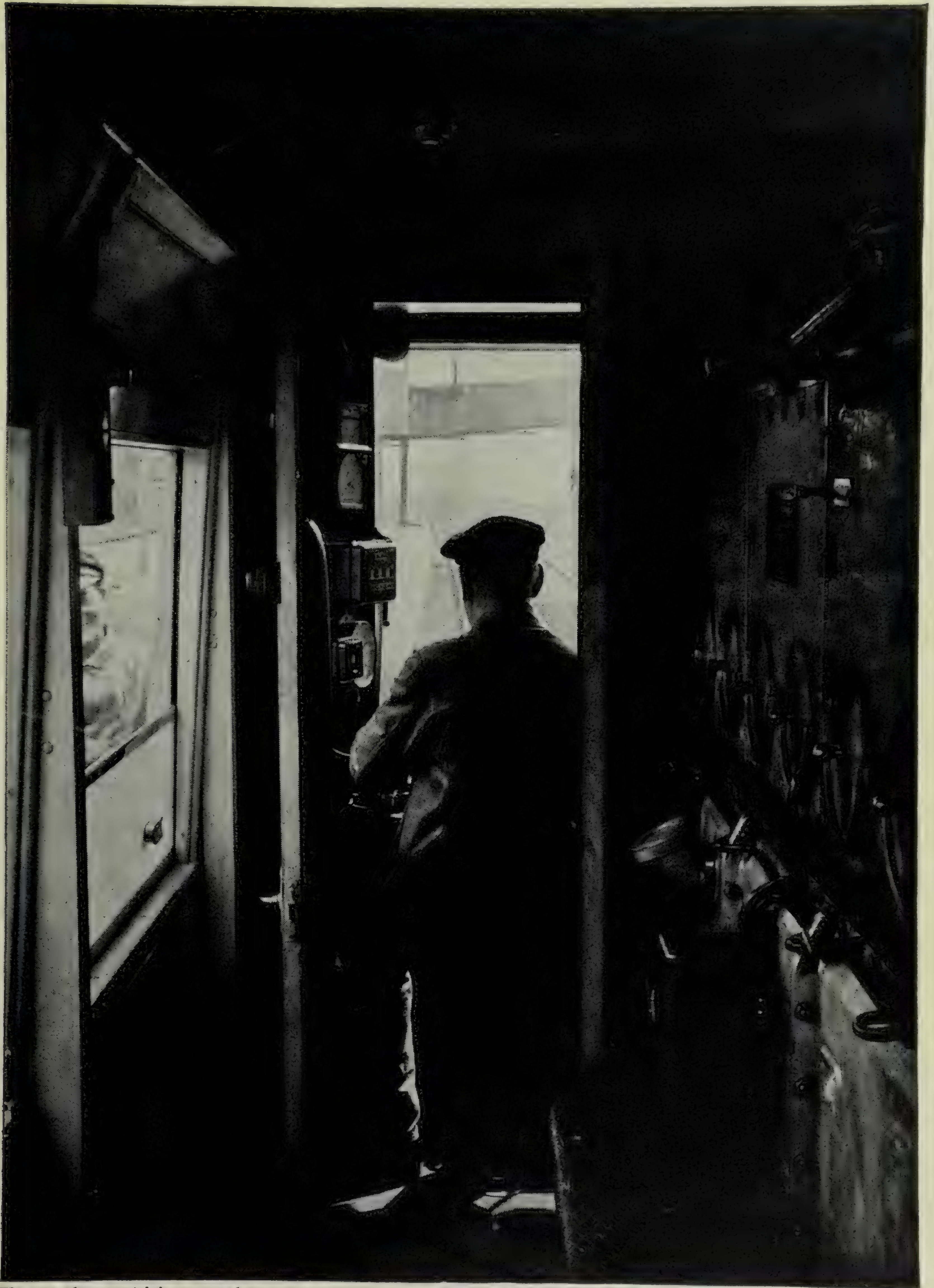
DO YOU EVER WONDER WHAT THE LOCOMOTION OF THE FUTURE WILL BE?

One day perhaps the engineers will make an oil-electric locomotive powerful and large enough to pull a big express train—up to the present cars to carry 150 passengers only have been built, but the cost of making these new machines is more than double the price of steam locomotives for the same work, and although they are very cheap to run as very little oil is used, oil is at present imported. Should we be able to make oil from our coal in large quantities, the oil-electric express train would be a serious competitor to the steam locomotive. Time alone will tell—meantime this new development is very interesting.

TYNESIDE VENTURER
P1254

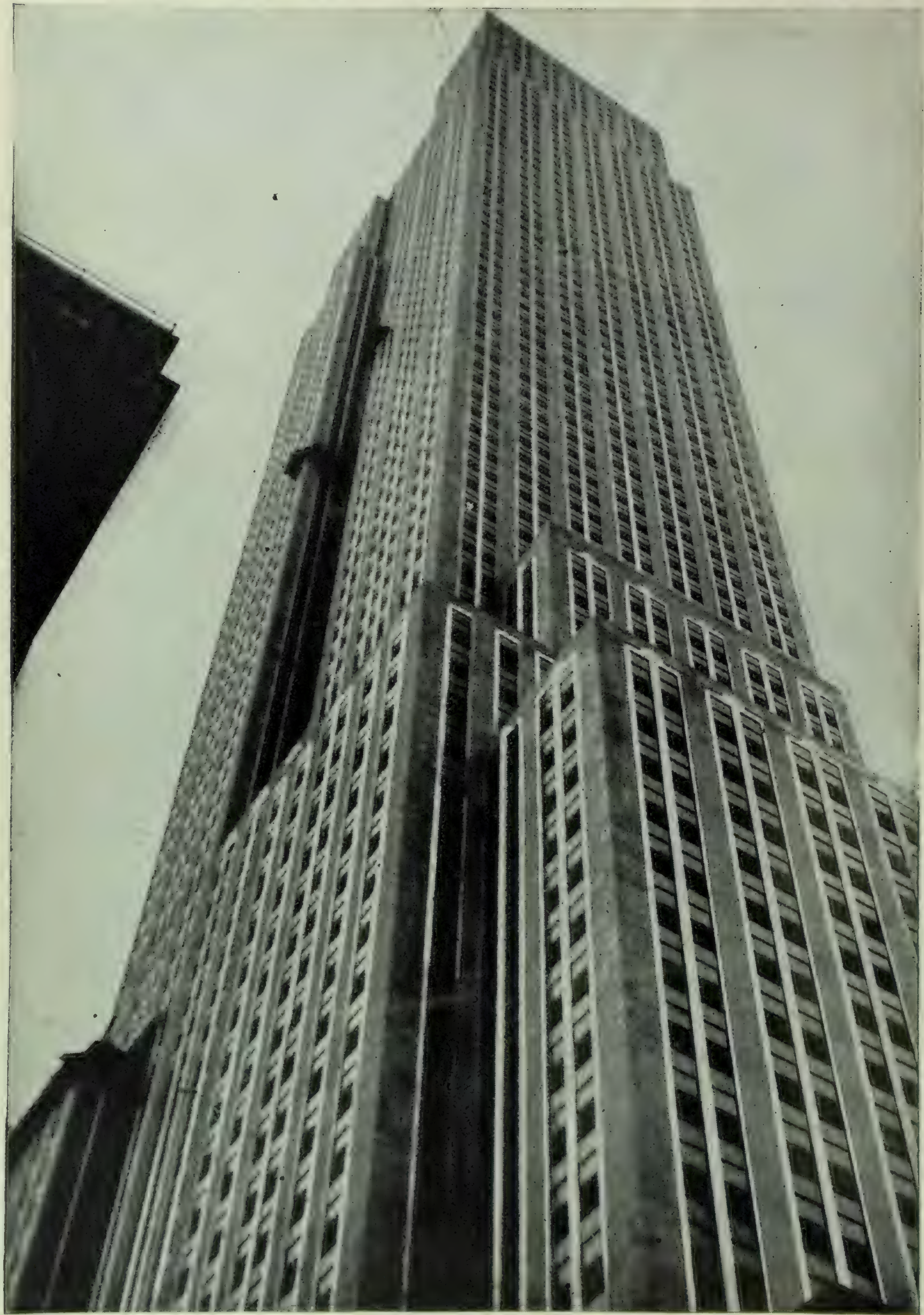
Modern railways find that the cost of upkeep, coupled with the strong competition of road transport, makes the profitable running of the system difficult. This new oil-electric train is one experiment in economy and increased efficiency.

HOW THE ENGINE-DRIVER SEES LIFE



We are always striving to make our means of travel swifter, and at the same time cheaper. The picture shows an oil-electric motor train, the "Tyneside Venturer," with the Diesel engine, which consumes crude oil, on the right.

LOOKING UP AT THE TALLEST SKYSCRAPER



This is what the Empire State Building looks like when you gaze upward at it. Can you count the storeys?

New York's skyline shows us giants of building enterprise. The Empire State, the world's tallest structure, is on the right.
[*Keystone*

HIGHEST, BIGGEST, LONGEST

The brain, hand and eye of man have joined forces to produce many marvellous structures, and Nature herself has countless miracles to show. Here we take a glimpse at some of the world's greatest wonders, natural and man-made. We visit the giant skyscrapers of America, see the largest flying-boat, the tallest waterfall, the greatest bridge, and many other wonders of our own day. The mighty Amazon gives us an example of Nature's amazing power, while the immense hole in the earth caused by the fall of a giant meteorite in America gives us a startling example of the forces of the worlds beyond. The skill of the artisan is represented in the world's largest carpet, and the greatest piece of engineering in dam construction is described in picture and story.

THE note to-day is one of progress. Either it is in the matter of size, in height or in length. In size we have aircraft, ships, locomotives and buildings. In height the magnificent skyscrapers, which are found mostly in America up to the present, and as regards length we can think of ships, bridges and dams, with tunnels too.

THE MONSTER OF THE AIR—A FLYING-BOAT FOR 100 PASSENGERS.

So far Germany has produced the biggest aeroplane, though strictly we should call it a flying-boat. It is, indeed, a huge craft—this "Do X" (pictured earlier in this book) with its 12 fine engines and capacity for more than 100 passengers. The roar of the motors when they are all out is deafening and when seen in the sky, flying with other aircraft, the "Do X" looks the giantess she is. She has been successful as an experiment, but, at the moment, has no sisters, though she is more than three years old. We talk of a ship displacing so many tons of water; that is to say when she is put in the water that is the weight of the water displaced by her hull. The "Do X" displaces fifty-one tons which, though small in comparison with the huge liner, is tremendous when compared with all other heavier-than-air aircraft. We stress heavier-than-air because the lighter-than-air craft, viz., the airships, are very much bigger than the "Do X," though again they have not the same passenger capacity. But whilst such a monster airship as the *Graf Zeppelin* (the biggest *commercial* airship now in service) will take her passengers right round the world, crossing several countries and oceans, the German flying-boat is intended for short cruises.

A BALLROOM IN THE CLOUDS—DANCING, EATING AND SLEEPING IN THE AIR.

This great Dornier flying-boat has an electric kitchen in her hull and also a dancing saloon nearly sixty feet long. This saloon can be converted to sleeping or dining quarters very quickly. Those twelve engines need a great deal of fuel, and as the quantity carried for a long cruise would seriously reduce her passenger capacity, it is intended that the cruises she makes shall be made up of 600-mile flights, then she can come down and refuel. It is clear, therefore, that the world's greatest flying machine is not intended for flying the Atlantic in a single hop; if she did her load of passengers would not be a paying one.

AMERICA GOES FORWARD WITH THE CONSTRUCTION OF HUGE AIRSHIPS.

When cruising some of her engines are cut out and given a rest. This reduces her maximum speed from about 150 miles an hour to something like 100, which most people would think quite fast enough.

The " Do X " carries a crew of twelve and of these two must be pilots, but they have nothing to do with the navigation of the big plane. This duty is entrusted to her captain and first officer. Then there is a chief engineer and four mechanics.

The giant airship is out of favour at the moment following on the disaster to our own R101, but the Americans are certain that their day will come, and already they have one or two monsters, with others projected. These are huge ships, and though they have not yet been sent on long voyages overseas, like the *Graf Zeppelin*, it is expected that they will make big flights before very long.

THE "MAJESTIC," THE WONDER SHIP OF 100,000 HORSE-POWER ENGINES.

At the moment this is written the biggest ship in service is the splendid *Majestic* of the White Star Line. We have to say at the moment, because things are moving rapidly in the world of ships, and the French and ourselves have liners building which will be much bigger than the *Majestic*, though she has held the record for over ten years. The new French liner is expected to be ready for sea by the spring of 1934 whilst our own Cunarder will, it is hoped, be completed soon after, though she has been held up on the stocks because of the great industrial depression experienced throughout the world. Both these will exceed 70,000 tons and have a length of more than 1000 feet.

Talking of tons, we mean tons *gross*, and this is not a weight computation, but a measurement of space within the vessel. Tons gross is very mystifying to the landsman, especially when he reads that the *Leviathan* is a bigger ship than the *Majestic*. Both ships, with the Cunarder *Berengaria*, were built in Germany and ran under other names, or rather it was intended that the *Majestic* should be the *Bismarck*, whilst the *Leviathan* was the *Vaderland*, and the *Berengaria* was the *Imperator*. After the war they changed flags, and the Americans secured the *Vaderland*; they reconstructed her and added new cabins. These increased, not her size, but her gross tonnage, and it was claimed that she was, therefore, the biggest ship in the world. But actually the *Majestic* had that honour ; she is 956 feet in length, 100 feet in width (called beam, as a rule), 112 feet deep, has a gross tonnage of 56,551 and turbine engines which have a horse-power of 100,000 and drive four big propellers. Imagine the power of 100,000 horses stored up within that great black hull. Horse-power is not quite the same as power exerted by a horse, but this figure does give some idea of the immense effort exerted by those turbines.

FUNNELS THROUGH WHICH TWO MOTOR CARS COULD PASS IN COMFORT.

Huge as this monster ship looks when afloat, it is when she is lifted clear of the sea by the big floating dock at Southampton that one gets some idea of her hugeness. " Some idea " is the correct expression, because it is impossible to see such a monster at any one point. When we mention that her depth is 112 feet this, of course, takes no account of the towering masts and funnels, but only of the hull. Those funnels, if laid down upon the ground, would allow two cars to pass through them together.

It is possible to get underneath this giantess when she is in dock and discover that her hull is not quite what we thought it would be. Our model boats come to a sharp edge at the bottom, but the giant liner is practically flat-bottomed, though her stem is almost like a knife in its sharpness. Men walking about on the floor of the dock look like flies when viewed from her bridge, and so we might go on making comparisons to show how very big these sea monsters really are.

THE WORLD'S WONDER BRIDGE IS A BRITISH TRIUMPH OF ENGINEERING.

Not so very long ago the world read of the magnificent scene which was staged for the opening of Sydney Bridge which spans the harbour of this great Australian city. A century since no one would have thought it probable, or possible, that a bridge could

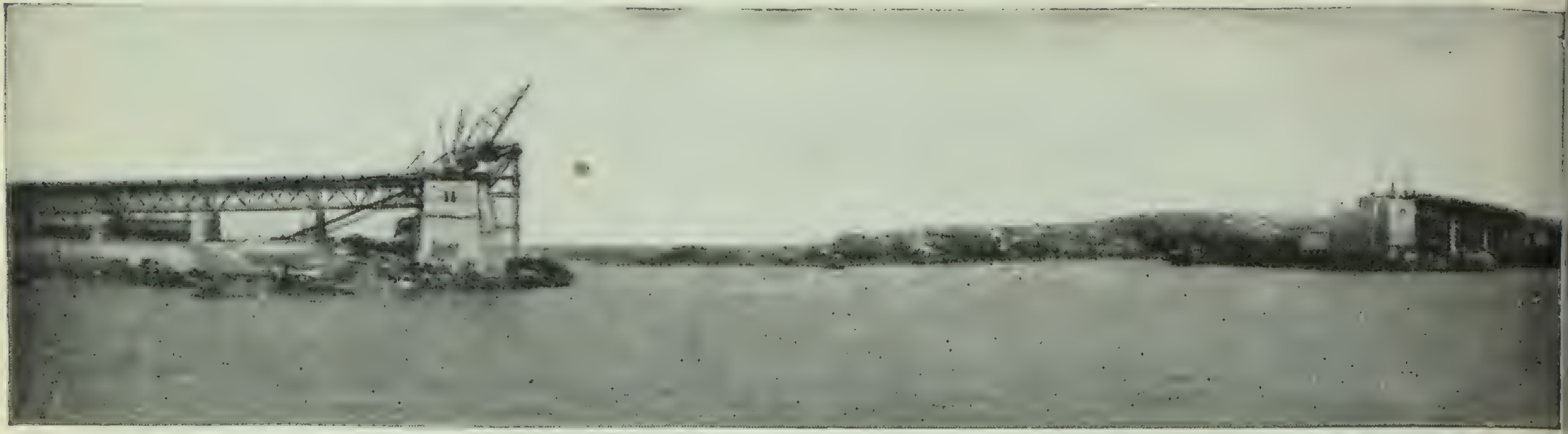
THE WORLD'S GREATEST OCEAN LINER

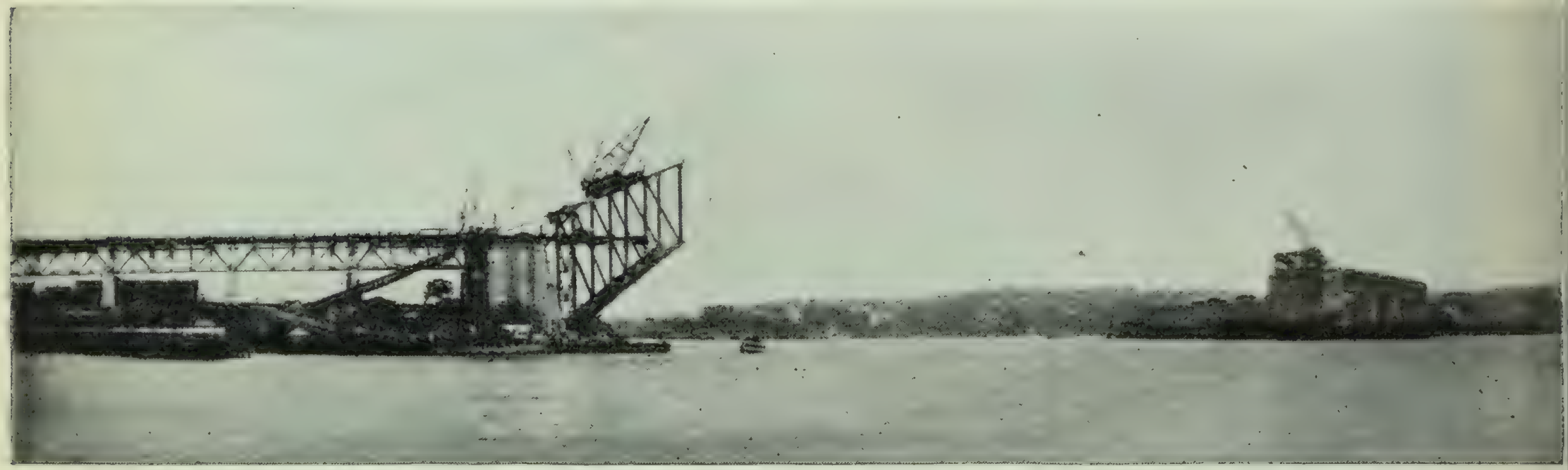
The largest ship on the seas to-day is the White Star liner, *Majestic*. She has a gross tonnage of 56,621, a length of over 900 feet, and is 100 feet wide at her broadest part. Such a ship is like a floating city, with shops, restaurants, hotels, tennis courts, clubs, a cinema, and other interesting features for the benefit of the passengers on their journey. Even a daily newspaper is printed aboard the ship as she goes on her swift journey across the high seas. Communication with the world is constantly kept up by means of wireless, and altogether, in a modern sea-castle such as the *Majestic* a voyage across the ocean is a pleasant and luxurious experience. It is almost impossible to feel the sea's motion, so steady is the ship.

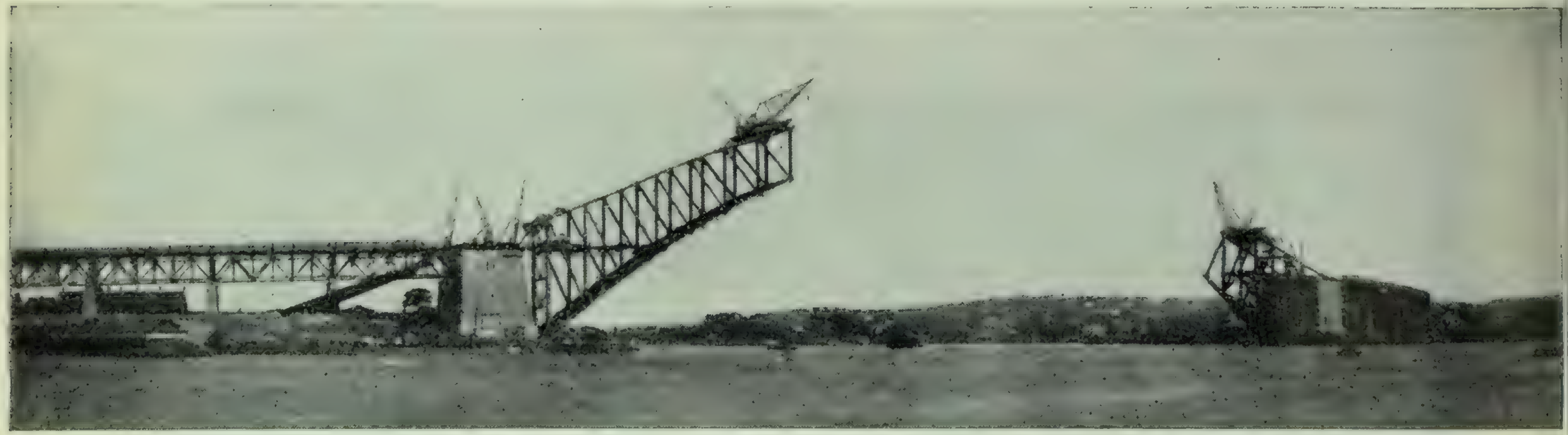
THE MAJESTIC'S MYRIAD NIGHT LIGHTS

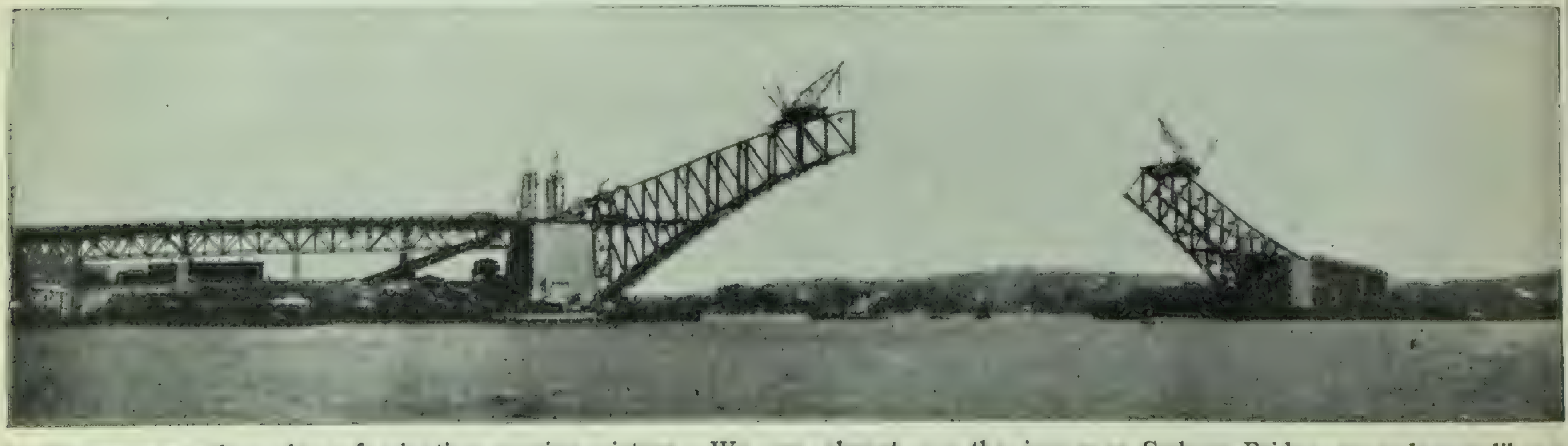
The *Majestic*, a German vessel once known as the *Bismarck*, presents a wonderful picture when seen ploughing its watery way by night. The thousands of lights at window and port-hole send their reflections into the waters around. When you realise that each dot of light seen shining from the hull denotes a cabin in the ship, you obtain some idea of the huge size of the vessel. A walk round the deck of this monster ship means a journey of almost half a mile.

A MOVING STORY OF HUMAN ACHIEVEMENT



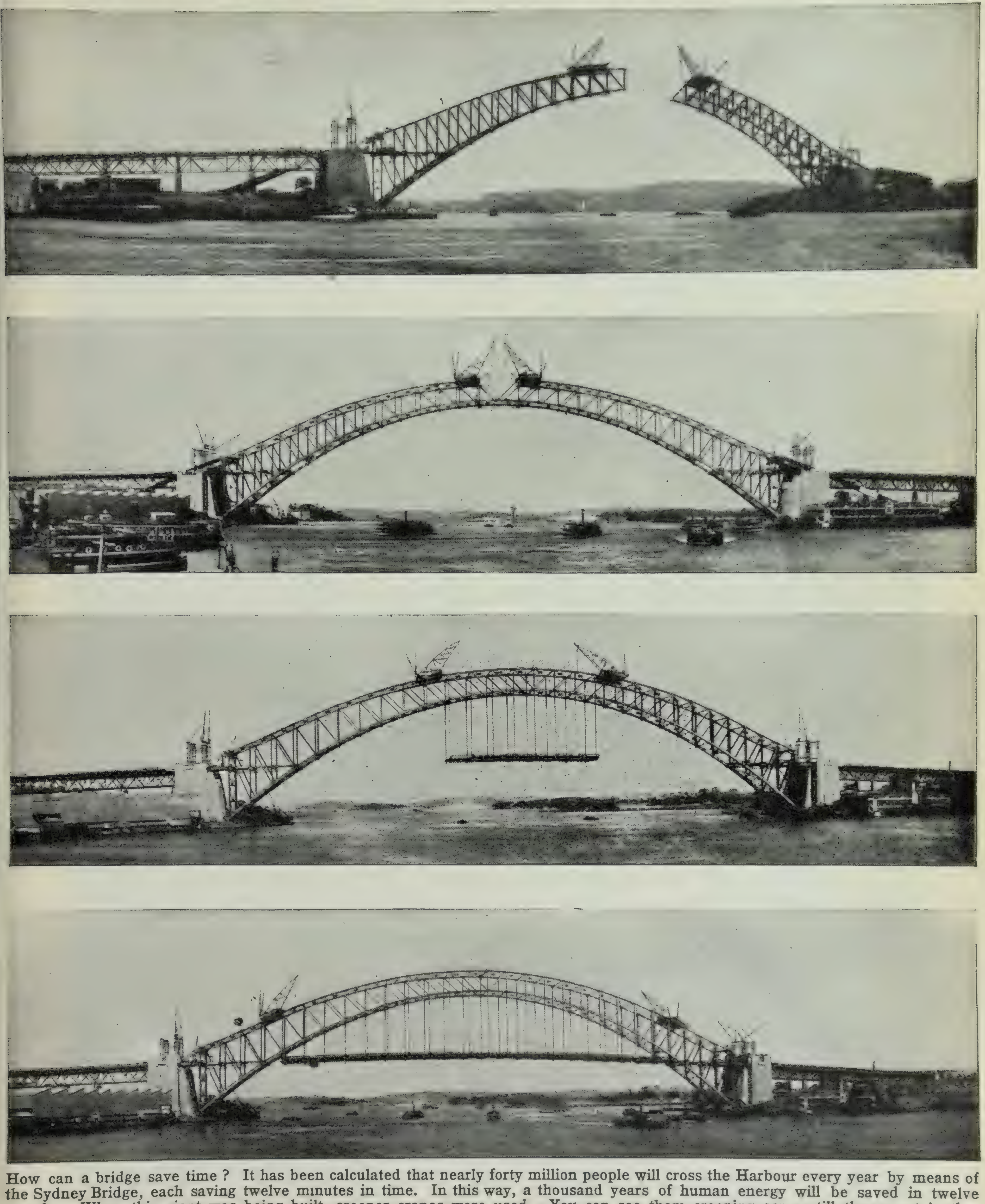






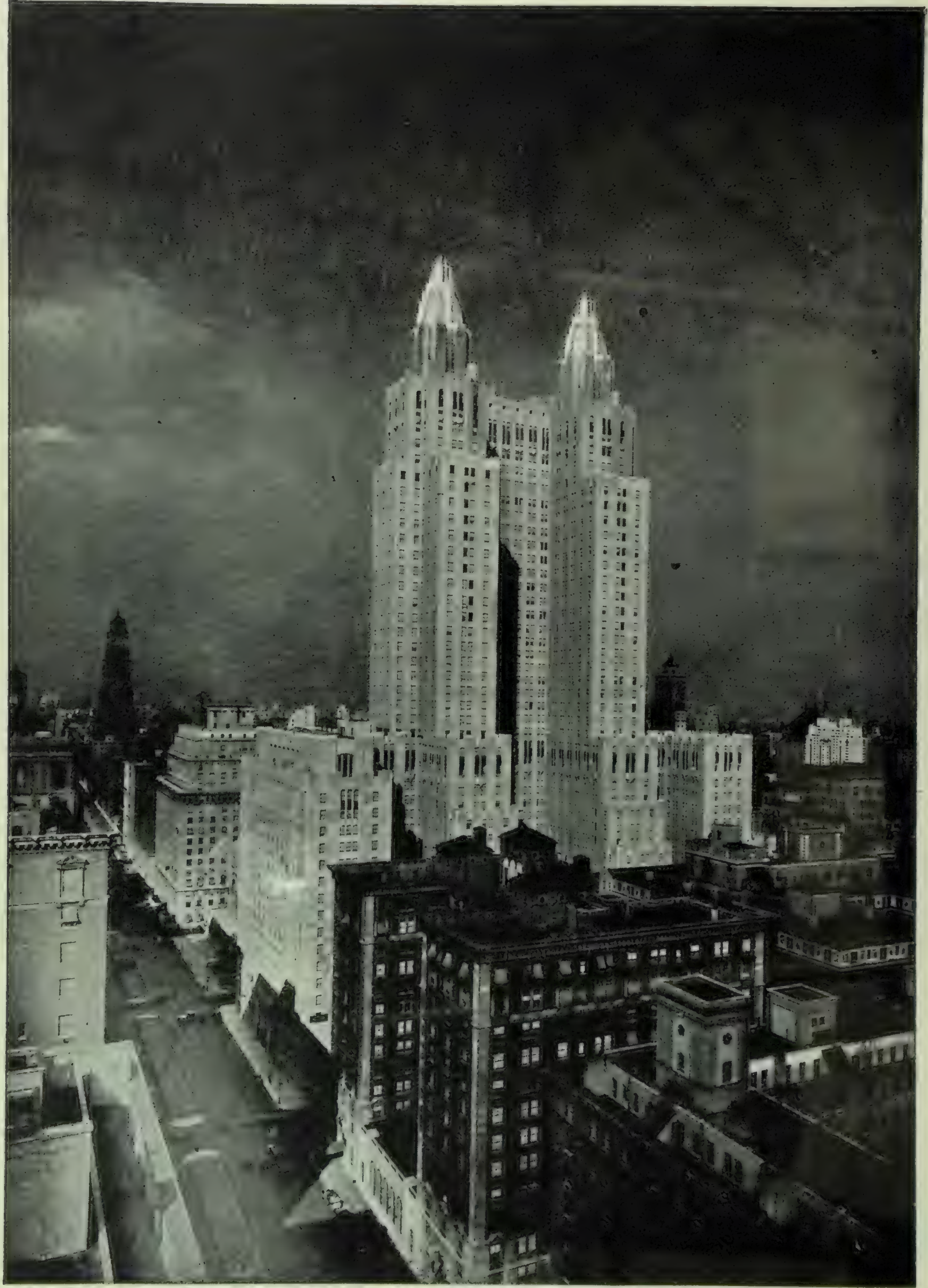
In these pages there is a fascinating moving picture. We can almost *see* the immense Sydney Bridge grow larger like a moving giant, till it spans the waters across the harbour, and ends finally in a perfect arch, supporting a road and railway track across the sparkling waters. The main span of this miracle bridge is 1650 feet long, and the great central roadway is 57 feet wide. There are two electric railway tracks on each side of this roadway, and one footway which is 10 feet wide.

HOW THE SYDNEY BRIDGE WAS BUILT



How can a bridge save time ? It has been calculated that nearly forty million people will cross the Harbour every year by means of the Sydney Bridge, each saving twelve minutes in time. In this way, a thousand years of human energy will be saved in twelve months. When this giant was being built, creeper cranes were used. You can see them creeping across till they meet in the middle, and then working their way back to their own pylons, as they lay the road and rail track.

NEAR THE CLOUDS IN A NEW YORK HOTEL



In New York, the city of giant skyscrapers, this great hotel, the Waldorf Astoria, is found. In the reception lounge of this palatial, many-storeyed building lies the world's largest carpet, as pictured on page 512.

be thrown over that great gap—a third of a mile in width—and in a single span. But the building of our own Forth Bridge taught the bridge architect many lessons. And the architect was backed up by the courage and skill of the bridge builder.

HOW A SMALL TYNE BRIDGE IS RELATED TO THE GREAT SYDNEY HARBOUR BRIDGE.

It is very difficult to say which is the greatest bridge in the world, because there are so many factors to be considered. There is the length—here America would score ; there is the height and span, and here we must allow the claims of Sydney Harbour Bridge to that honour, though there is at the moment another bridge under planning—possibly under construction by the time this appears—crossing the Golden Gate at San Francisco. This monster will have a main span over 4000 feet in length which will be supplemented by two others providing a structure 6640 feet in length. Then there will be two main towers, each with a height of over 1000 feet !

Sydney Harbour could have been spanned quite easily by a bridge such as that which crosses the Forth—that is, one with several spans, but the authorities declared that they could have no interruption of the fairway of what is without doubt the most beautiful of all the harbours of the world. This new bridge was to cost ten million pounds, and, naturally, there was great competition all over the world to get such a splendid order. It was to be an all-British bridge, however, for the authorities decided that Dorman Long and Co., the great bridge builders of Middlesborough, should carry out the stupendous task. To make sure of the order their bridge engineers prepared no fewer than seven sets of plans, giving the assessors a good choice of various kinds of bridge. If you ever go to Newcastle-on-Tyne you may see the father of the Sydney Harbour Bridge, though the one which spans the Tyne is also a newcomer. Its design is practically the same, though the span, of course, is much smaller.

The monster Sydney Bridge, built over the lovely harbour, stands out as one of the greatest building miracles of our age.

[By courtesy of Messrs. Dorman Long, Ltd.

HOW THE SYDNEY BRIDGE GREW TILL IT SPANNED THE HARBOUR.

First came the cutting of the foundations on either side of the harbour ; these were carried down to a depth of twenty-five feet into the solid rock, and upon the firm rock came the heavy bearings, each weighing 300 tons. It was necessary to begin on either side and work towards the middle where, should a miscalculation or a mismeasurement have taken place there would have been failure instead of success. Little by little the people of Sydney saw their bridge going over the sea until there were only yards separating the two ends. Why did not the

The Tyne Bridge at Newcastle is a fine specimen of the same type as the great Sydney Bridge. It is of the same design, but is much smaller in size.

ends dip as they approached each other, much as a long fishing rod gives way towards its business end?

It was because the whole was supported by those huge arcs which go up to a tremendous height in a graceful curve and have suspended beneath them a series of strong legs which hold up the broad platform. This has room for four lines of railway and a main road nearly sixty feet wide, beside two footways, each ten feet wide. This monster bridge weighs 50,000 tons counting steel alone, whilst the weight of the two great towers at either end which support the feet of the giant arc needed thousands of tons of reinforced concrete with a tremendous number of solid stone blocks for facing the concrete. The tops of the four towers are 285 feet above the sea level. At least 100,000 people cross Sydney Bridge each day of the year.

HOW THE HIGHEST TOWER IN THE WORLD CAME TO BE BUILT.

The highest tower in the world is that of which Paris is so proud, the Eiffel Tower. It is 984 feet in height from base to summit and consists of four distinct sections. The first is an arch formed from four huge feet which spring from a concrete base and, sloping inwards, forms a giant platform from which the next storey goes upwards, also with an inward slope. Then comes the longest section, which is much lighter in construction and is built up of steel lattice work with a gradual tapering until it ends with a platform upon which the lantern—the fourth section—is placed. A lift takes visitors from ground level to the base of the lantern and from this vantage point a magnificent view of Paris and far beyond is obtained on a clear day.

The Eiffel Tower was built to enhance the attractions of the Paris Exposition of 1889, and though there have been many suggestions made that it should be taken down in case it should collapse, it is still one of the greatest attractions of Paris, also it has now come into a new usefulness with the development of wireless, being one of the best known stations at present in service. Eiffel was so proud of his tower that, until his death a few years ago, he regularly used a room which was kept for him at a considerable distance up the tower. Although the Eiffel Tower is the tallest structure built entirely of steel there are many skyscrapers in America which are still higher, and are really far more remarkable, because each storey is used for offices or dwellings.

THE SKYSCRAPER THAT MAKES ALL OTHERS LOOK INSIGNIFICANT BESIDE IT.

We do not take kindly to the skyscraper in this country, but in America, the land of their birth, such buildings are becoming more and more the fashion. At first the giant skyscrapers were rather ugly—one of them was called the Flatiron, because in appearance it resembled a flatiron set up on end. But now there are some really beautiful structures which, especially when seen from a distance, put one in mind of Gothic cathedrals. Many of them have fine towers upon them and reach a height of over 1000 feet.

In New York, second city of the world, stands the Empire State Building, dwarfing the skyscrapers that have long been the boast of American builders and engineers. The highest point in this giant structure is 1248 feet above the street level. If you were a fly, therefore, crawling up *this* wall you would walk nearly a quarter of a mile before you reached the top! In the base of the building alone there are six storeys, as high as the usual London business building itself. But in all, there are 102 storeys! The great central shaft rises to the twenty-first floor or 250 feet from the sidewalks. 5800 men were employed in the building and five men lost their lives during the work. This is remarkably few when we consider the danger they risked amongst the towering girders which are the " skeleton " of this giant of steel and stone.

It is wonderful to think that this man-made mountain in Manhattan, New York, is about a third of the height of Snowdon, the highest mountain in England and Wales !

ONE OF THE MAN-MADE GIANTS OF NEW YORK CITY.

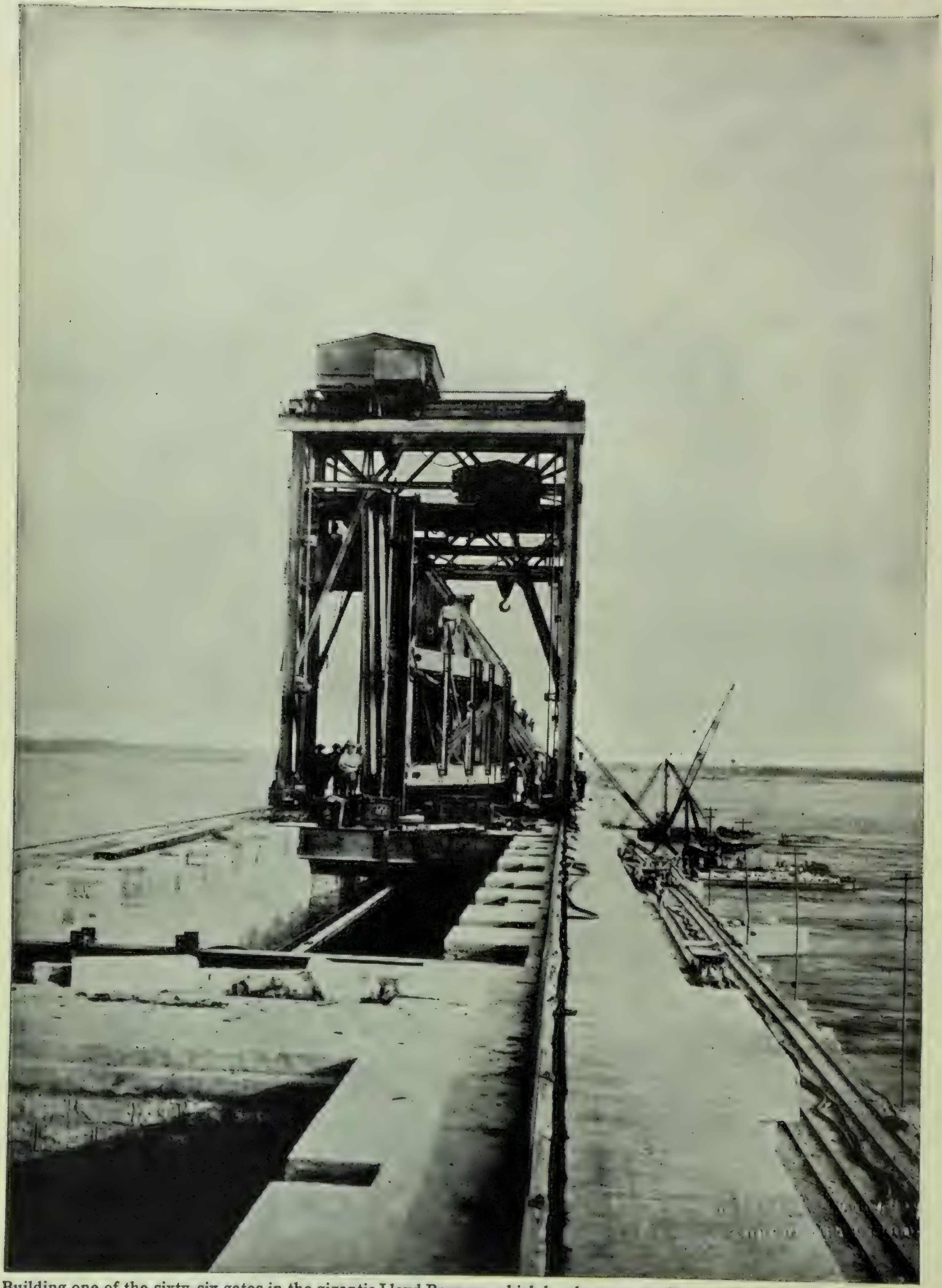
Chrysler Building is some two hundred feet shorter than the Empire State Building, and has a most beautiful tower in the modern style. Indeed, the whole building is a marvel of beauty, of clean lines, fine perspective and glorious geometric forms. Rising to a height of 1046 feet it has seventy-seven storeys (reached by a fleet of thirty passenger lifts), and presents a magnificent frontage on three famous streets in the heart of New York City. The main structure is of steel faced with black, white and gray bricks, black granite and white marble, and in the interior all sorts of rare woods, metals and marbles have been combined in an effect of great beauty and power. On the ceiling of the vast lobby is the largest wall-painting in the world (110 feet by 97 feet), a marvellous picture symbolising man's conquest of natural forces.

HOW A MODERN SKYSCRAPER IS DESIGNED AND BUILT.

The work of designing and building a skyscraper calls for the greatest skill and patience. Before anything is done towards the building a series of try-out models is made. First come the drawings which are carried out to scale, so that the prospective owners may know exactly how the finished building would appear. From a hundred drawings—often there is an open competition—three or four will be selected for final choice. From these the architects will be asked to make actual models, true in every detail. In the case of one notable skyscraper, five actual models were made and two distinct styles of architecture were shown in them—Renaissance and Gothic. After looking at the models from every point of view the owner of the site said that he would have a Gothic design, but would like the tower made higher and more graceful. This was done, and a fresh model prepared. Then the contract for the building was given to a firm of builders who cleared the site in record time, gangs of men working in three shifts, and next the basement was excavated to thirty feet in order that the space below the ground might be used, whilst at the same time the base might be sufficiently strong. Whilst this was going forward the steel works were making the framing and numbering it ready, piling it in stacks. Concrete was being assembled and orders given for all windows, doors, etc., together with the lifts, boilers and the thousand and one things that were necessary. Once the foundations were ready the work went ahead rapidly, the steelwork being delivered in just the right quantities and in the right order. In sixteen months the skyscraper was in use !

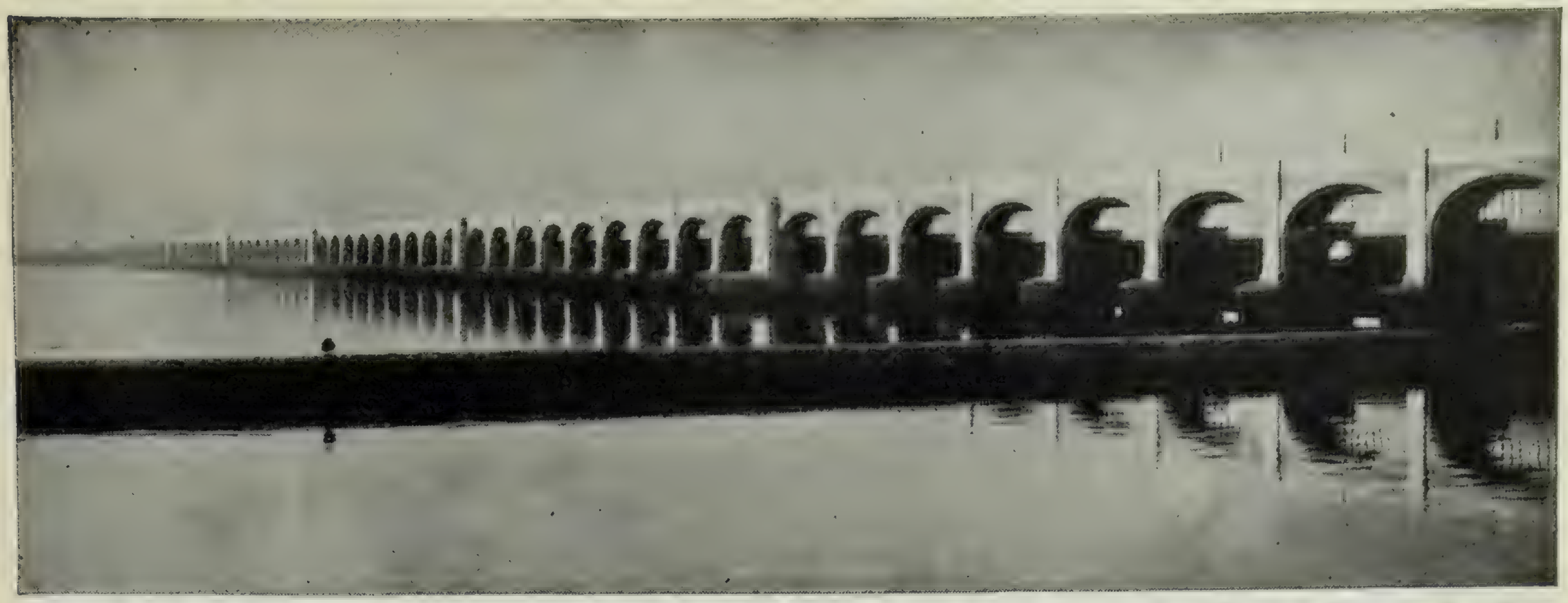
The Chrysler Building. The large tower soaring almost to the clouds has an observatory on the seventy-first floor.

BUILDING A BARRAGE ACROSS THE INDUS



Building one of the sixty-six gates in the gigantic Lloyd Barrage, which has been erected across the Indus. They are each 60 feet in width and weigh 50 tons. At times each gate has to withstand a pressure of about 300 tons of water.

A NINE YEARS' FIGHT AGAINST FAMINE



There are sixty-six spans in the enormous Lloyd Barrage, which is five times the length of London Bridge. It will be the means of bringing a large tract of hitherto desert country, nearly double the area of Wales, under cultivation.

MANY of us do not know that the recently completed Lloyd Barrage, that mighty retaining wall which has been thrown across the Indus, in Sind, was built to fight what has always proved to be the scourge of India—famine.

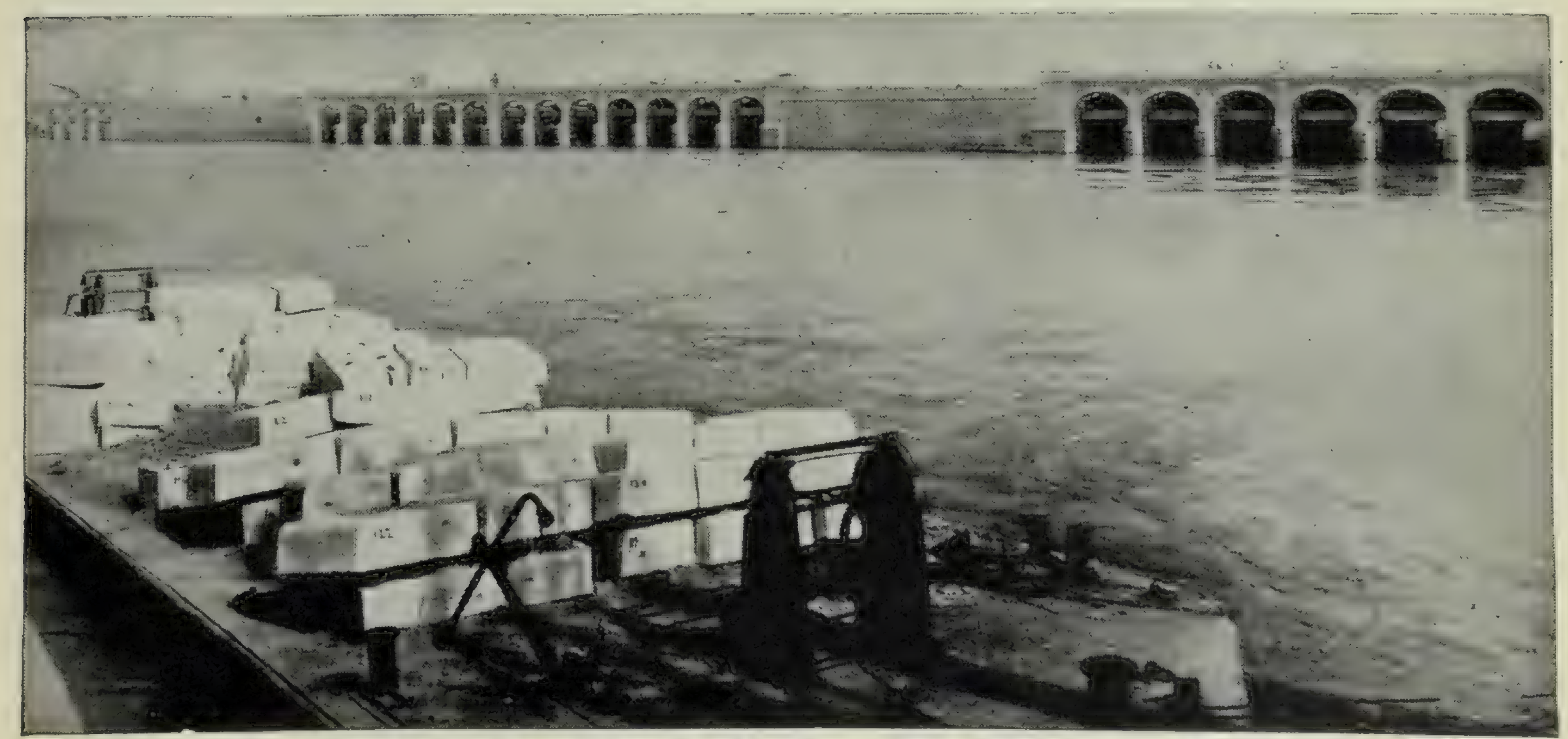
GREAT FAMINES, OWING TO THE FAILURE OF THE RAINS, SWEPT OVER INDIA.

Yet it is only one of many similar undertakings which have been carried out by British engineers in their efforts to conquer India's dreaded enemy. India has always suffered from famines.

The Bengal famine of 1874 carried off a million human beings, while a like number perished in the famine of 1877. In the famine of 1896-97 no fewer than 2,500,000 died, while the death roll of the terrible famine of 1900 reached over three millions. In that year, owing to the failure of the rains, 85,000,000 people, about twice the number in the British Isles, were brought to the verge of starvation. Scarcely a year has elapsed from that day to this without the Indian Government reporting vast tracts of territory where the crops failed on account of the lack of rains, bringing millions of people to the brink of starvation with a loss in some cases of many thousands of lives.

A DARING SCHEME THAT WILL PUT AN END TO INDIA'S FAMINE.

The Lloyd Barrage is the latest and in some respects the most spectacular of the daring irrigation schemes to be carried out in India to fight famine. It has demanded nine years of patient toil in a hot, arid land, far from the



By means of this great Barrage, the water is regulated into specially built canals, so that the barren tracts of desert land can be irrigated and made fertile. The head regulators of three of the main canals are shown in the picture.

centres of civilisation, and called for an expenditure of £15,000,000.

This great retaining wall across one of the world's most noted streams is a mile in length, or about five times the length of London Bridge. It consists of 66 spans, each 60 feet wide, pierced by as many gates, which alone weigh 50 tons apiece. It is by means of this barrage that the flow of the river will be regulated and the water turned into specially dug canals to irrigate what has hitherto been desert land. There are no less than 6166 miles of these canals and channels spreading over an enormous area. They will be the means of bringing over seven million acres of parched and waste land under cultivation, upon which will be grown two million tons of valuable crops—wheat, barley, rice, cotton, sugar-cane, worth about £20,000,000 per annum.

HOW A FIGHT AGAINST GREAT ODDS HAS PROVED SUCCESSFUL.

The building of the Lloyd Barrage proved a very arduous task. The survey parties had to work across vast stretches of totally uninhabited country, where water and food were difficult to supply. The heat was very trying, but what the men feared most was the presence of man-eating tigers which prowled around the camps at night. Armed sentries had to be posted at each camp after dusk to drive them away, but they succeeded in carrying off several workmen.

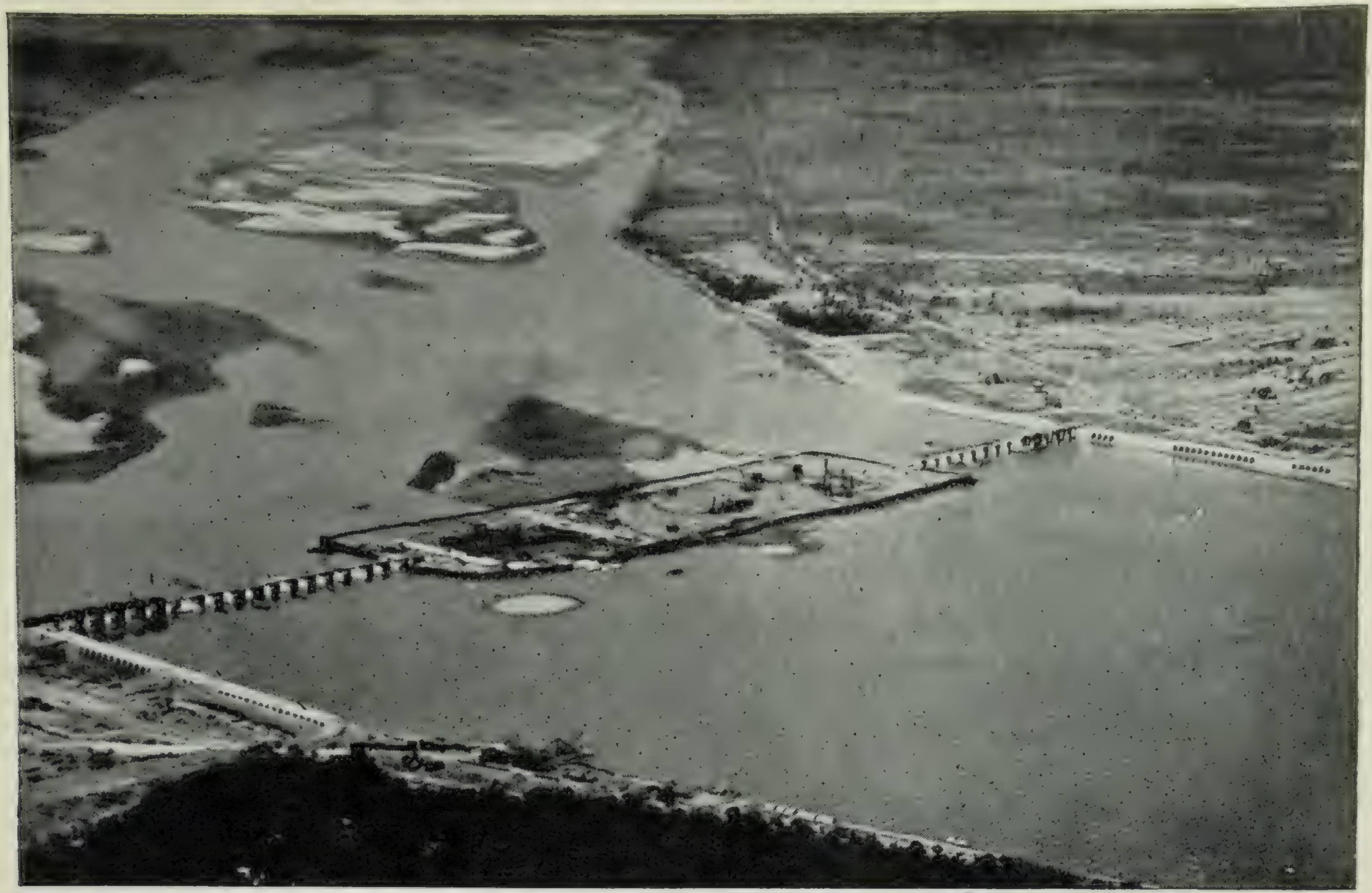
AT LAST, IN SPITE OF GREAT DIFFICULTIES, THE BARRAGE IS BUILT.

Also, the dam had to be constructed in a river subject to violent and sudden floods, in an uninhabited tract of country, far from a village, and much farther from a railway. Incessant rain for half a year prevented the importation of labour, and made all work impossible for a time. All difficulties, however, were overcome, and the labour has been well rewarded. On the reclaimed land there are now hundreds of thriving villages and a population of over a million people. The plan has succeeded and India's dreaded enemy—famine—has been conquered.

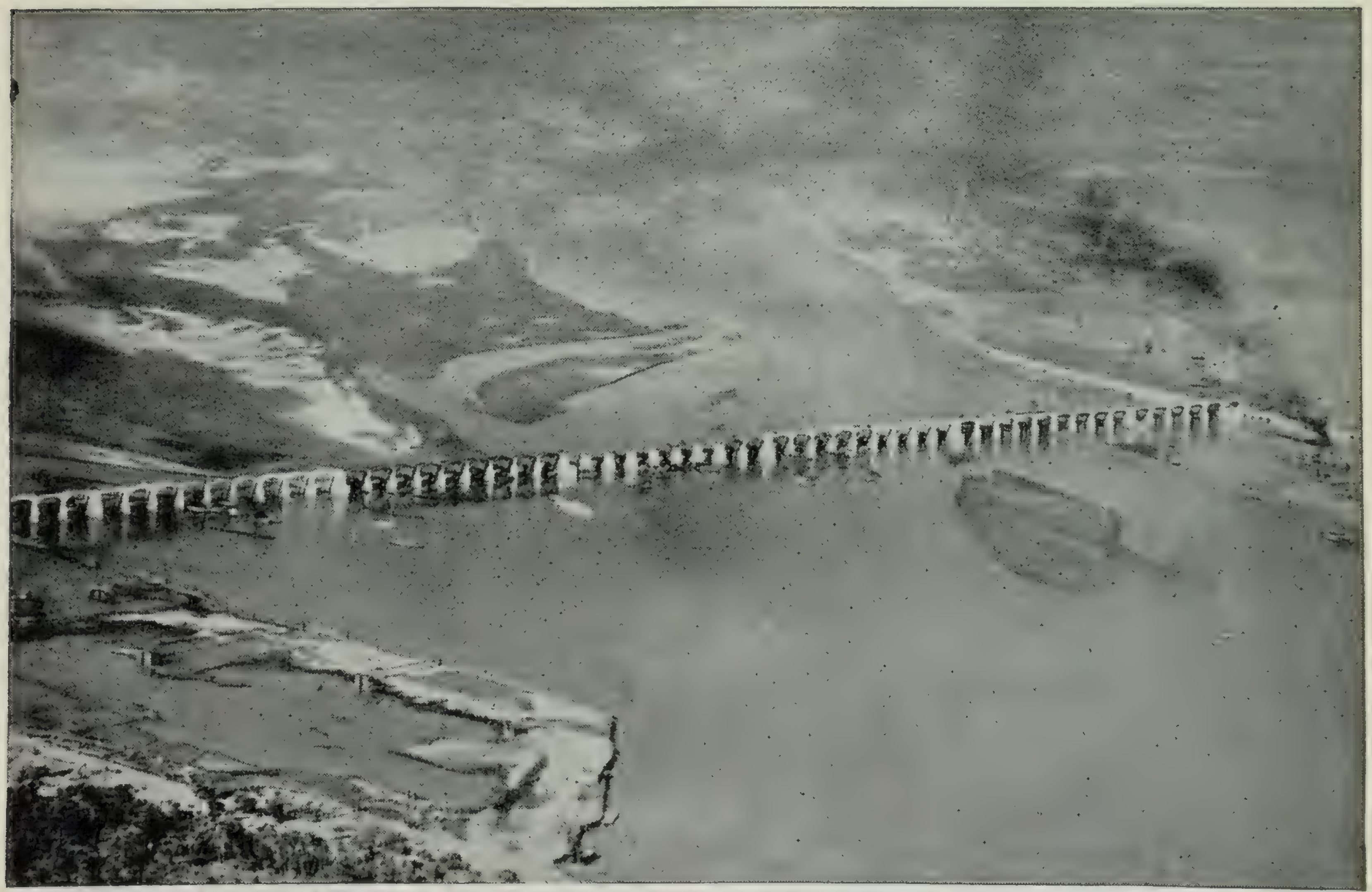
The millions spent upon these great irrigation enterprises is not wasted. It comes back to the government in the form of rents for land and water rates, the return in many cases being six per cent. upon the capital outlay.

Workmen had to fight the discomforts of scorching heat and blinding sand in the wilds of the desert, when building the Lloyd Barrage. The picture shows a dragline at work, digging a canal through the heart of the desert.

AIR VIEWS OF AN ENGINEERING MIRACLE

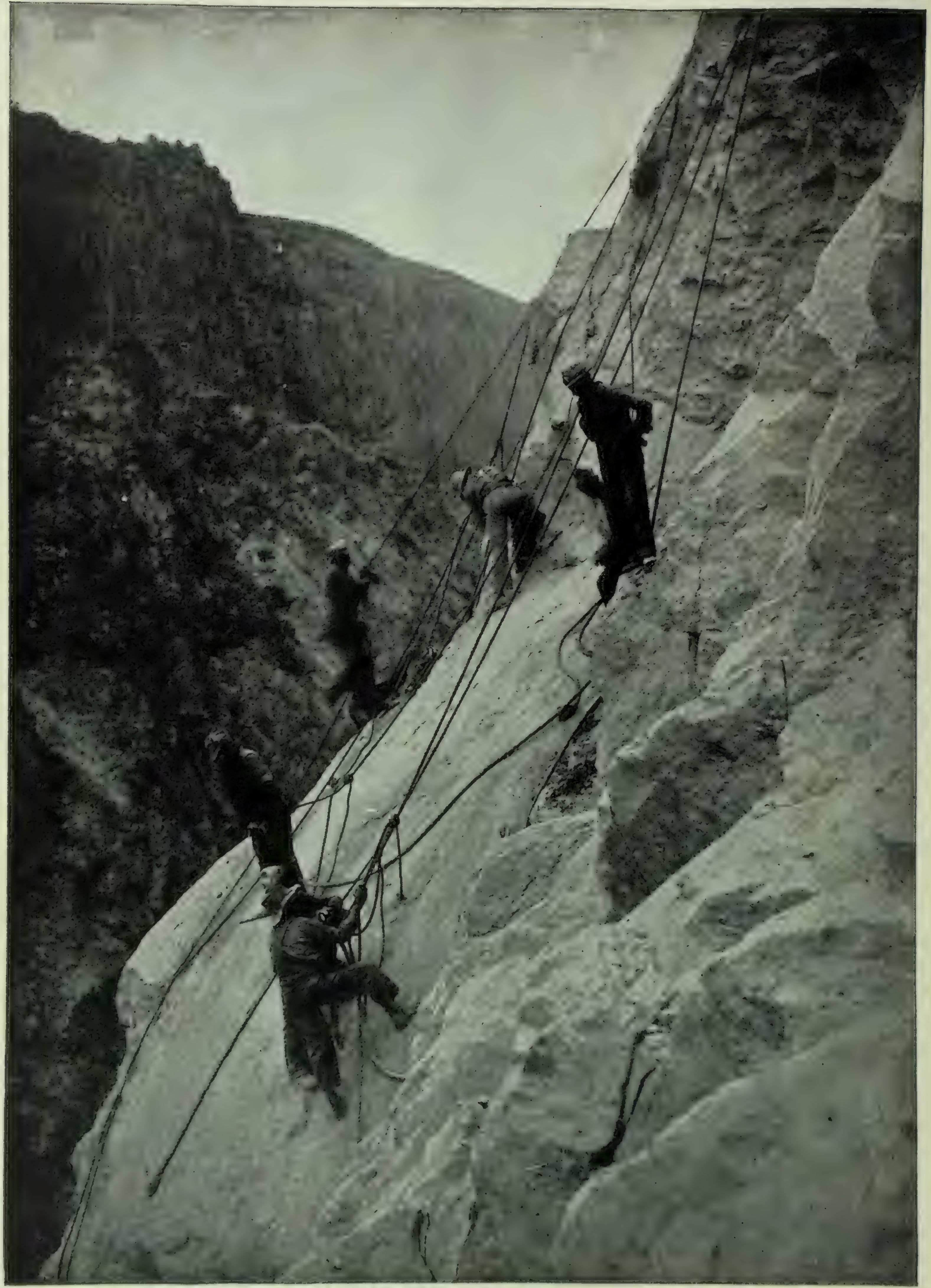


The foundations of the Lloyd Barrage were obtained by means of immense cofferdams. Our view shows work upon the central cofferdam in midstream. The cofferdam was formed of interlocking piling. Then the water was pumped out, and the concrete foundation was laid across the river.



An aerial view of the Lloyd Barrage taken a year before its completion, showing the immense cofferdams in course of formation on either bank for the construction of the divide walls. The head regulators of the canals are visible on the right bank.

ALL CHAINED TO THEIR DANGEROUS JOB



Would you care to work like this, on the face of the cliff, with a yawning chasm beneath you ? These " high-scalers " are at work on the site for the intake towers for the Hoover Dam Scheme, 550 feet above the Colorado river.

THE WORLD'S GREATEST IRRIGATION TASK

A model settlement, known as Boulder City, has been built for the workers engaged on the great Hoover Dam. This desert home, which provides accommodation for 2500 workmen and their families, has paved streets, trees and gardens like other modern cities. There are schools, churches and cinemas, too, in this model city. [*Shepstone*

IN the rock-walled recesses of a canyon on the Colorado River, in Western America, there has been put in hand a colossal engineering feat, known as the Hoover Dam. It is the most amazing undertaking of its kind any government has ever attempted to carry out.

It is much greater than Sennar Dam in the Sudan, and the more recent engineering wonder, the Lloyd Barrage in Sind. Some idea of the vast character of the scheme will be apparent when it is stated that it will entail an expenditure of over £77,000,000, or £14,000,000 more than was expended upon the Panama Canal. It is more than the revenue of many European states.

HOW A GREAT RIVER IS TAMED TO WATER THE DESERT.

While the principal function of this vast undertaking is to obtain control of an obstinate river and so save a flourishing valley settlement from periodical inundation, it will also provide water for irrigating a vast tract of desert land, and in addition the river will be made to supply electrical energy for light and power purposes, and a water-supply for distant cities.

The Hoover Dam, in fact, is no ordinary undertaking, and the question of harnessing the Colorado has been a bone of contention among the politicians of Western America for the past seven or eight years. It is necessary to tame this river to save from inundation the prosperous and fertile Imperial Valley, with its 100,000 settlers and yearly crops representing a value of £20,000,000.

THE GREAT HOOVER DAM WILL PREVENT FLOODING AND SUPPLY POWER FOR ELECTRICITY.

The Imperial Valley lies in the State of California, and its citizens appealed to their own local government for help. But it was clear to the engineers that the most appropriate place for attack upon the river was much farther down in the adjoining State of Arizona, and at a point where the river forms the boundary between that state and Nevada.

But Arizona and Nevada were jealous of the water that flowed along their boundaries, and in the end it was arranged for the Federal Government at Washington to undertake the task of erecting a dam. In addition, the government are to carry out an extensive irrigation programme, and other items as well.

The project, in fact, will save the Imperial and Coachilla Valleys from being flooded, and water over 2,000,000 acres of desert and waste land. The pent-up waters will be used for driving turbines and generating 1,800,000 horse-power, and will supply the cities of Southern California with a much-needed water-supply.

HOW THE COLORADO WILL LOSE ITS TERROR AND BE MADE TO FULFIL A USEFUL PURPOSE.

The spot selected for attack upon the river, which drains an area thirty times larger than the country drained by the Thames, is at a place called Black Canyon, some thirty miles to the south-east of Las Vegas. At this point the river rushes through half-mile-high granite walls at a speed sometimes of thirty miles an hour!

The construction of a dam at this point will regulate the flow of the stream and curb its violent and uncertain nature. Back in 1905 it overflowed its banks, cut a deep channel seventy miles long through the desert to the Salton Sea, increasing the water surface area of that lake by 330,000 acres. Early in June, 1922, it wiped out almost half the Palo Verde Valley, hopelessly submerging settlements and farms, ruining thousands of pounds worth of standing crops and rendering thousands of people homeless.

Over and over again the settlers of Imperial Valley, which lies 100 to 350 feet below the river—the valley itself being actually below sea-level—have been called out to fight back the flood waters of the Colorado. Only by herculean efforts and by pressing into service every man, horse, and vehicle have their homes and farms been saved.

HOW A MODEL CITY SPRANG UP IN THE WILDS OF THE DESERT.

As already stated, work upon the undertaking has now begun. Some six miles due west from the dam site, a settlement has been built at a cost of £400,000, known as Boulder City, providing accommodation for 2500 workmen and their families. This model city in the desert boasts of mercantile establishments, churches, schools, cinemas, waterworks, and electric light.

The first task of the engineers is the boring of a number of tunnels through the canyon walls into flats below the dam site. These are to provide outlets so that the flow of the stream may be partially diverted in order to permit work upon the dam. There will be four main tunnels 50 feet in diameter and three miles in length, and forty-eight smaller tunnels from 8½ to 30 feet in diameter.

The diversion or main tunnels have now been drilled. Special machinery was employed for this purpose and the work was carried on without cessation day and night. All told, over four million cubic yards of rock and debris was removed. The average was 250 feet depth of rock removed in a day.

Work upon the dam proper will not begin until all the tunnels are bored, while in addition some eleven small cofferdams will be erected among the mountains to hold back the impounded waters. All the tunnels will be lined with concrete, and the cost of this work alone will amount to £600,000.

As soon as the tunnels are finished a temporary barrier built of rock will be thrown across the stream to divert the flow into the tunnels and enable work to proceed upon the dam. This massive concrete structure will have a total height of 730 feet, or double the height of St. Paul's Cathedral. It will be 650 feet wide at the base, tapering to 45 feet at the top, and measuring 1180 feet along the crest. It will be of arch-gravity type, in which the water load is carried by both gravity and horizontal arch action.

HOW THE WATER LEVEL OF THE RIVER WILL BE RAISED TO 582 FEET.

This colossus of dams will contain more concrete—over five million barrels of cement—than the Reclamation Bureau of the United States Government has used in its projects during the past twenty-six years. Thirty-five million pounds weight of steel bars and rails will be used as reinforcements.

This great retaining wall will result in raising the water level of the river 582 feet and creating the largest artificial lake in the world. It will be 115 miles in length, with a maximum width of eight miles, and will have a shoreline of 550 miles. When filled it will hold 30,500,000 acre-feet of water.

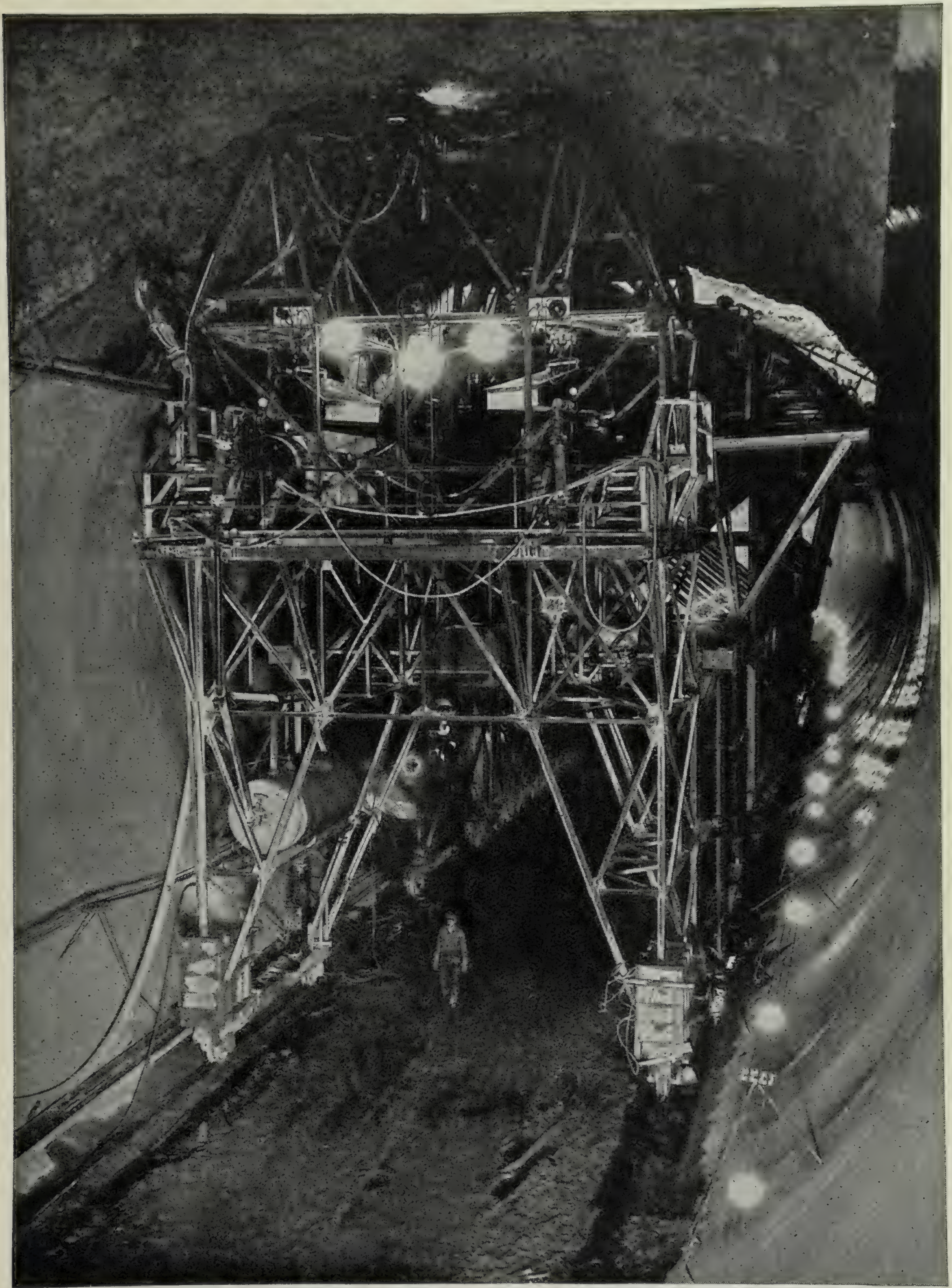
An acre-foot of water is the amount which will cover one acre of land to a depth of a foot. The water in this single reservoir would be sufficient to cover the whole of Wales to a depth of ten feet!

At the dam site a hydro-electric plant will be erected capable of generating electrical energy representing 1,800,000 horse-power, and equipment proposed includes fifteen 115,000 horse-power and two 55,000 horse-power turbines, with generators of enormous power. The output of this single power plant will equal the combined energy of the great power stations at Niagara. The estimated cost of the power station alone is £7,650,000.

HOW THE DAM WILL REPAY THE MONEY SPENT ON ITS CONSTRUCTION.

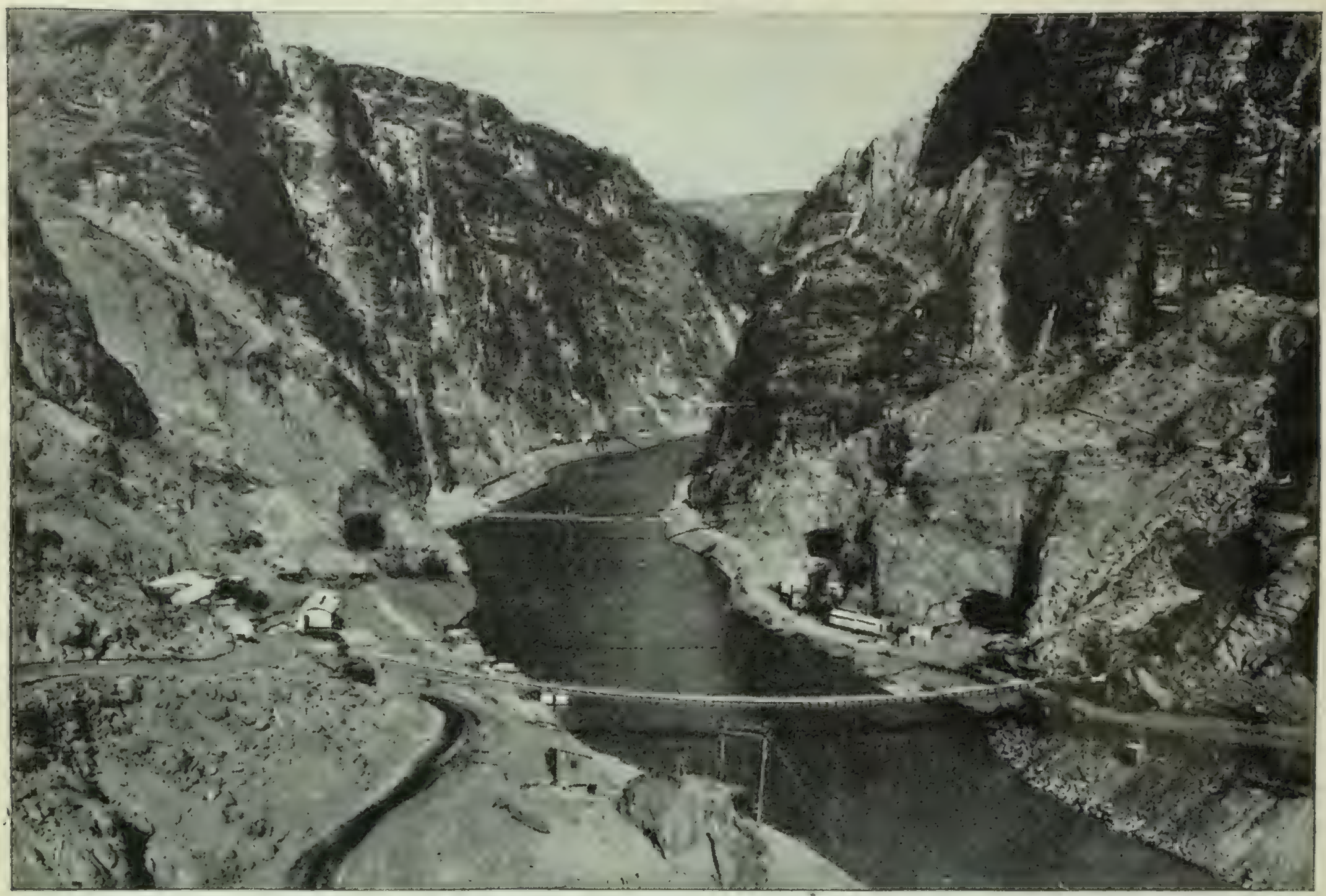
It is mainly from the sale of this power to the cities in California, Arizona, and Nevada that the government will be able to repay itself for the millions spent upon the undertaking. In addition to this revenue, there will be the income from the water supplied to distant cities. Los Angeles is to take water from the Hoover Reservoir. This will entail

THE MONSTER CONCRETING MACHINE

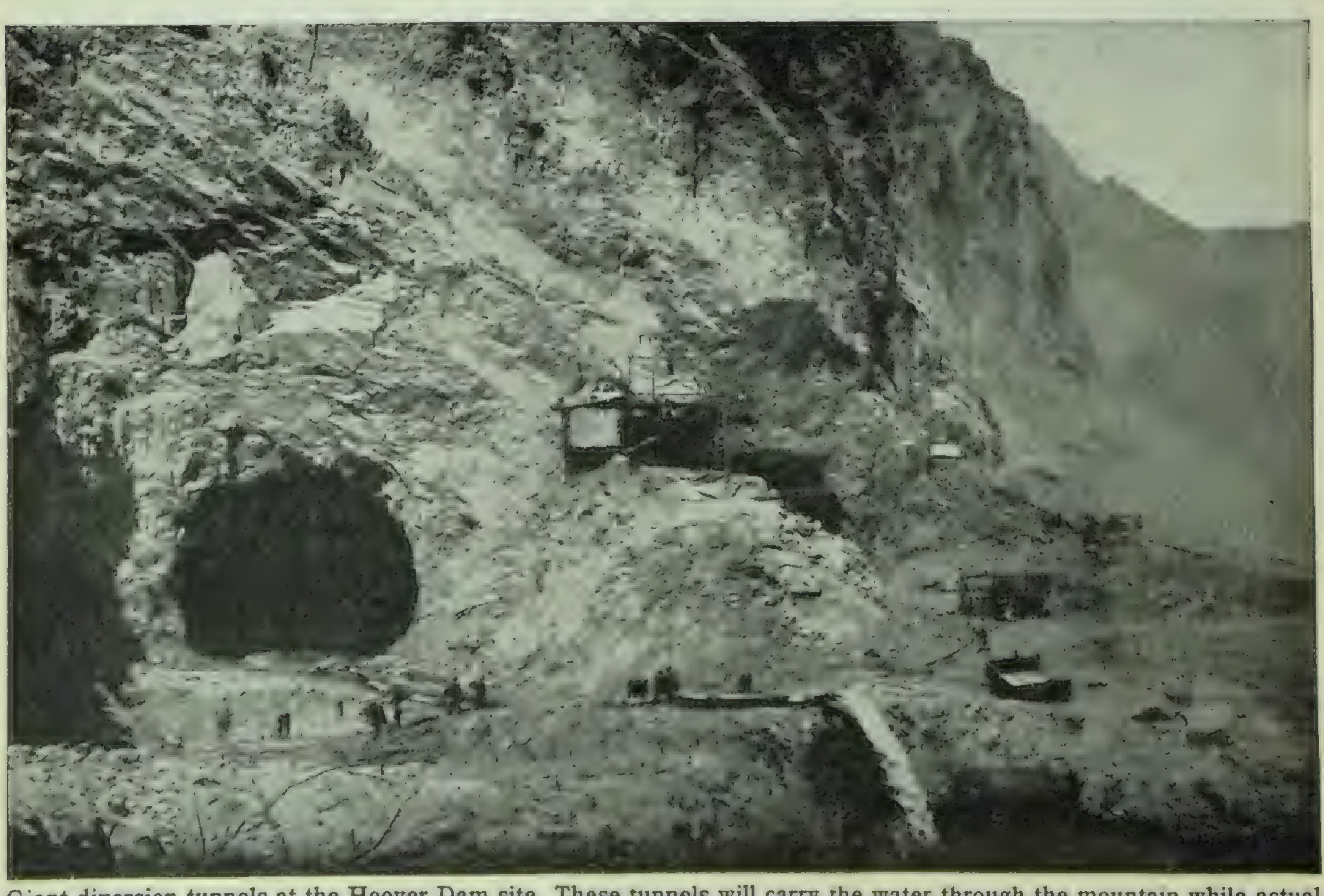


The tunnels for diverting the river are 50 feet in diameter. Here is one of the huge machines used for forcing concrete into the top arch of the tunnel. A comparison with the workman in the centre of the road gives you some idea of the size of the machine. When the work across the river is in progress the waters will be turned into the tunnels.

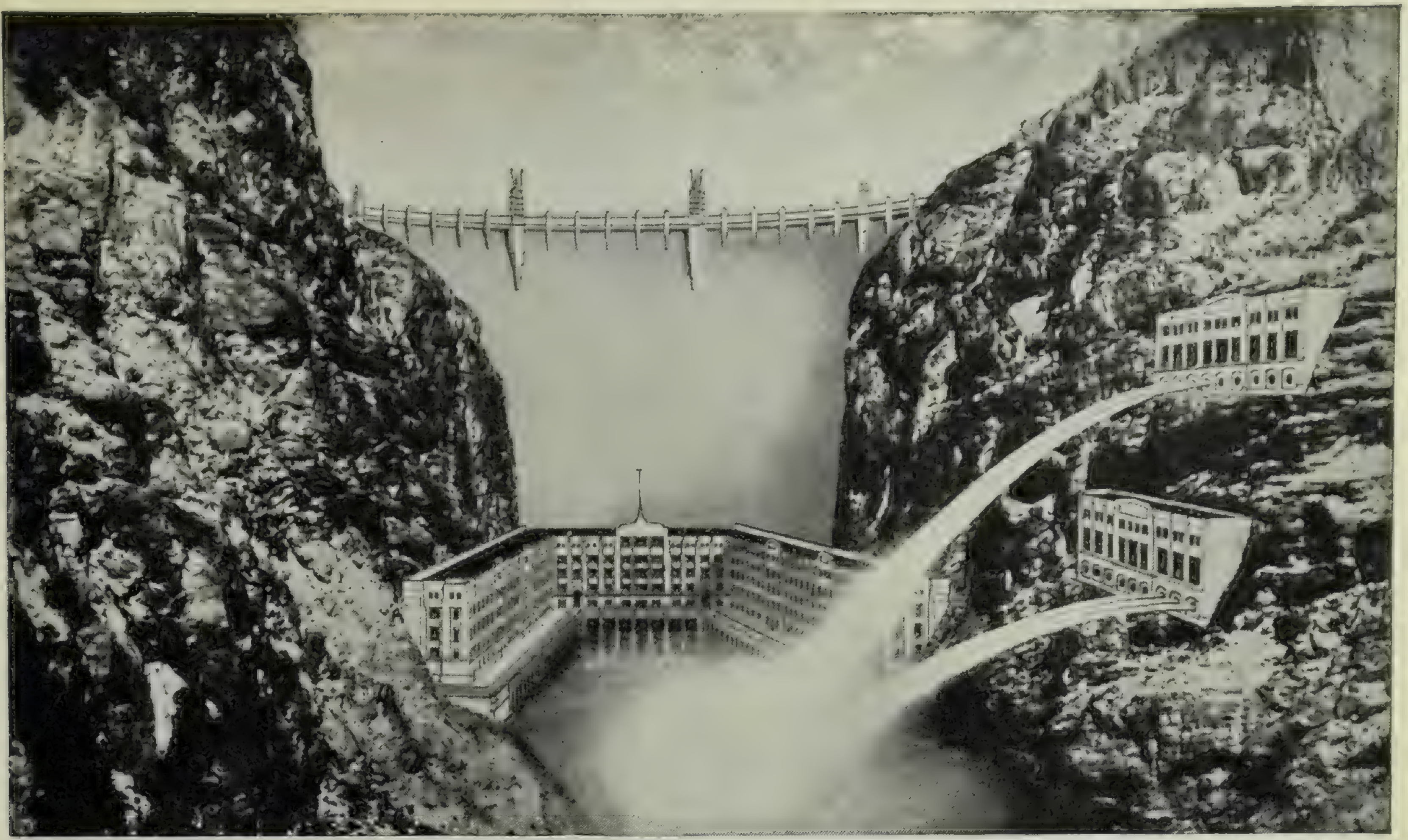
HOW THE COLORADO RIVER IS TO BE TAMED



If we look up the Colorado River towards the site of the monster Hoover Dam, we can see the entrance to the 50-foot tunnels which are being bored to carry off the water during the construction of the dam.



Giant diversion tunnels at the Hoover Dam site. These tunnels will carry the water through the mountain while actual construction work is being done on the dam. The men in the foreground are preparing a great powder blast.



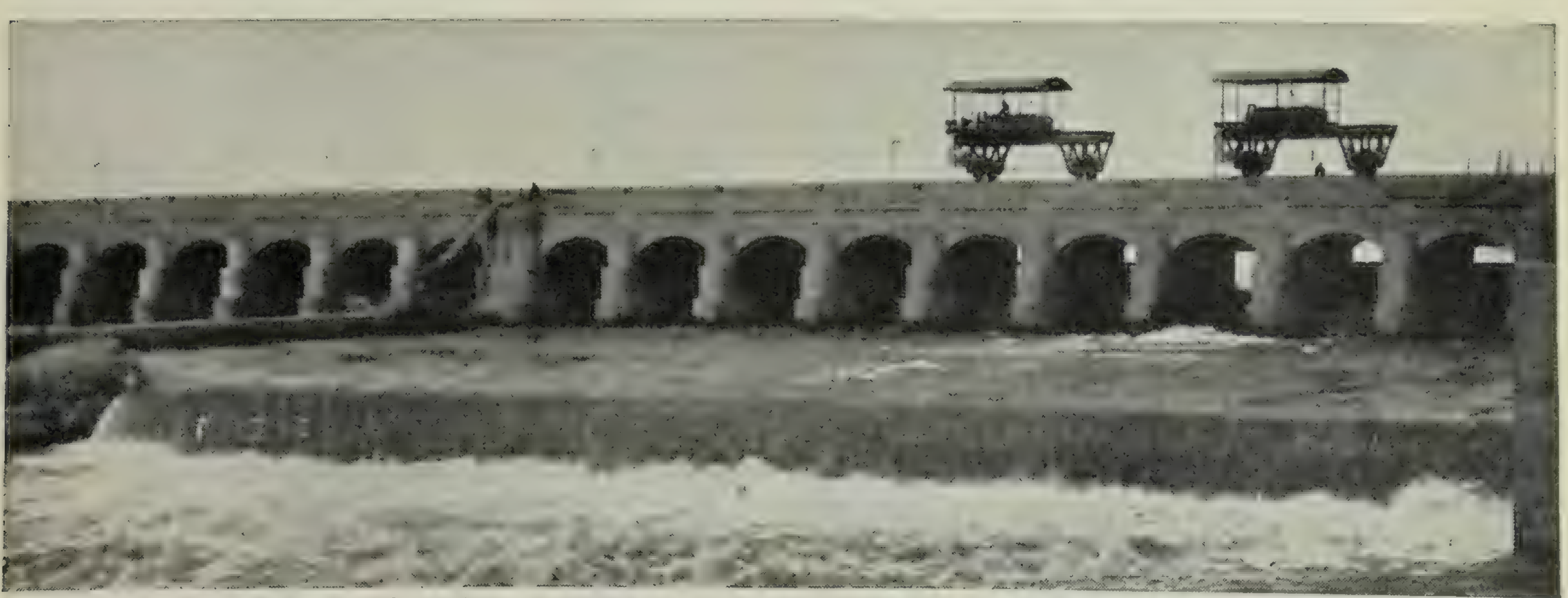
This is how the architect saw the Hoover Dam in his mind, and it will appear like this drawing when completed. The cost of building this barrier will be £77,000,000, but the government expect it to repay this within fifty years.

the building of an aqueduct 265 miles in length across mountains and deserts. The charge will be a shilling per acre-foot for domestic water.

A FORTUNE SPENT ON THE DAM WILL BE REPAID WITHIN FIFTY YEARS.

Then by means of specially constructed canals, as wide and as deep as an ordinary river, water will be carried to the Imperial and Coachilla valleys, where some 500,000 acres of desert and waste land will be brought under cultivation. Upon this part of the scheme £7,300,000 will be expended. These valleys are in California, but there are other areas in Arizona and Nevada which could be also reclaimed, and no doubt will be in years to come.

The whole scheme is certainly a colossal undertaking, and we are destined to hear much about the Hoover Dam for some time, as the work is expected to occupy at least seven years. The Union Pacific Railway are already arranging to run excursions to the dam site. Although the dam and its tributary products—power plant, irrigation channels, aqueducts for water-supply, etc.—will represent an expenditure of some £77,000,000, the Government of the United States expects to see the whole of this vast outlay back within a period of fifty years.



To illustrate the similarity of method in building dams, this view of the Hindiyah Barrage across the Euphrates in Iraq is given. Some of the sluice gates are here shown open. The dam is 815 feet in length with thirty-six openings.

BRINGING PROSPERITY TO EGYPT

IN the hot sandy wastes of northern Egypt British engineers are carrying out a daring engineering feat. They are raising the great Assuan Dam another thirty feet. They have been engaged upon this task since 1929 and October, 1933, should witness its completion.

Of the four mighty dams which have been thrown across the Nile in Egypt, the Assuan structure is by far the most stupendous. It is estimated that upon these four great retaining walls something like £25,000,000 has been expended. But they have been the means of bringing many millions of acres of otherwise desert and worthless land under cultivation, upon which to-day are grown luxuriant crops of cotton, tobacco, sugar-cane, maize and indigo.

Egypt, in fact, owes her prosperity to these dams and to the work of the irrigating engineer. She is a rainless country, and before her river was harnessed she was never certain about her crops and was continually being faced with famine.

HOW SEVERAL CROPS CAN BE GROWN IN A YEAR IN THE NILE VALLEY.

At flood time the valley through which the Nile flows was inundated, and, when the water receded, crops were sown and harvested before the river rose again. Naturally, agriculture under such conditions was limited to the extent of land covered by the rising water. The ancient Pharaohs endeavoured to extend the area by constructing canals and ditches. But the Nile is erratic, some years rising higher than at others. This meant, until the engineers came along and tamed the waters, that in periods of drought, when the water was low, famine would result, and at other times crops would be ruined because of the abnormal height of the water.

The engineer has changed all this by throwing mighty dams across the river at four different points, thus forming huge reservoirs from which the farmer can draw water as required, irrespective of the season. This has meant that two or more crops can be obtained in a year.

The first of these dams, or barrages, is at Delta, just below Cairo, the second at Assiut, the third at Esneh, and the fourth at Assuan, the mightiest of them all. It was heightened and strengthened just before the Great War of 1914-1918, and is now being raised again for the second time. As it stood, before the present work of raising it was put in hand, it was capable of storing 2,500 million tons of water, a sufficient quantity to supply the domestic needs of Great Britain and France.

HOW A GREAT BARRAGE CRACKED AND WAS SWEPT TOWARDS THE OCEAN.

The Delta barrage was begun by the French, but when an attempt was made to hold up the stream with it, the structure cracked and began to move bodily towards the Mediterranean! Mehemet Ali, the then Khedive, ordered the structure to be taken away, work which would have entailed a cost of £500,000. It was at this juncture that Sir Colin Moncrieff and the celebrated irrigation engineer, Sir William Willcocks, came upon the scene, and declared that for the sum it would cost to take the barrage down they could make it good, and this was finally done, bringing 1,700,000 acres of land under cultivation. Steamers, of course, can pass through the dams by means of side locks.

Some 250 miles from Cairo is Assiut, the thriving capital of Upper Egypt, where we have the Nile's second barrage, rather more than half a mile long, which has resulted in the reclaiming of half a million acres of desert land. Another journey of 240 miles brings one to the Esneh barrage, built principally with a view to controlling the river level when the Nile is in flood.

Then, 110 miles farther north again, and 750 miles from the Mediterranean, is the great Assuan dam, built across the First Cataract, and now being raised for the second time. This spot was selected for attack upon the stream because the river here is bounded by granite hills, and has a rocky bed in which firm foundations could be secured. The task before the engineers was this: to build a great masonry mass, weighing a million tons, across five channels, through which the water rushes at a speed of sixteen miles an hour with a turbulence almost, if not quite, equal to that of the Niagara Rapids.

HOW A BUSY TOWN WAS FOUNDED IN THE MIDST OF THE DESERT.

In a short time the hitherto unpopulated desert was transformed into a busy town with works, offices, machine shops, hospital, and accommodation for 20,000 natives and Europeans. To the credit of the contractors be it stated that every precaution was taken to guard against sickness and accident among the workers. In view of the danger of sun-

Raising the great dam at Assuan. The whole structure has to be strengthened from the foundations upward by adding masonry, so that its height will be raised 30 feet. Workmen are busy, in the blazing heat, digging out the foundation.

stroke, tents were set up at many points, each containing a bath, ice-box and a telephone. If a man succumbed to the heat, he was hastily placed in the nearest ice-water bath to await the doctor who had already been summoned through the telephone. Consequently, hardly a life was lost by sunstroke.

ENGINEERS HAD TO FIGHT THE CURRENT BEFORE THE FOUNDATIONS COULD BE SECURED.

Naturally, the most difficult part of the undertaking was the securing of the foundations. They were obtained under the protection of "sudds," or islands formed of tangled masses of grasses, leaves and twigs. In the dry season, when the water flowed through the deep channels, stones weighing from one to twelve tons each were flung into the stream a little way below the line of the dam. The violence of the current was so great that the engineers had sometimes to fasten several of the largest stones together with steel wires, rope them to a truck, and send truck and all flying into the gap. A similar barrier was built above the line of the dam, the water then pumped out of this enclosure, and the foundations secured before the Nile rose again.

The completed dam was no mean structure. Measuring from shore to shore a mile and a quarter in length, it had a height of 120 feet from the foundations, and a width at the bottom of 100 feet, tapering to 24 feet at the top, whereupon was constructed a roadway. The total weight of masonry used was over a million tons. It is pierced by no fewer than 180 sluice gates, 140 of them measuring 23 feet in height by 6½ feet in breadth.

If the engineers had had their way they would have built the dam much higher than 120 feet, but they gave way to the wishes of archæologists and others who were anxious to save from complete flooding the ancient Egyptian temples on the island of Philae. As it was, these old temples were partially covered by water for five months of the year, from January to June.

HOW AN ARMY OF MEN SLAVED FOR FIVE YEARS TO RAISE THE DAM.

The dam was completed in 1902, but it was not long before the cry was for more water, and the Egyptian Government decided to raise it another 23 feet. This work was put in hand in 1907 and occupied an army of men for five years. Not only was the dam raised in height, but from the foundations upwards it was strengthened by additional masonry.

Here the engineers were faced with a problem. Every one knows that when railway lines are laid down a tiny gap is left between the rails to allow for expansion caused by the heat of the sun, and the same arrangement has to be made in the building of steel bridges. To have bound new masonry firmly to the old at Assuan, without sufficient time being allowed for the new and the old to harmonise in their movements, might have spelt disaster. So a peculiar method for the thickening of the dam was adopted. The face of the old wall had a number of steel rods built into it, and the new portion thickening it was built between two to six inches away from the old, deriving its support from these rods. Obviously, this space had eventually to be filled up, and cement was employed for this purpose.

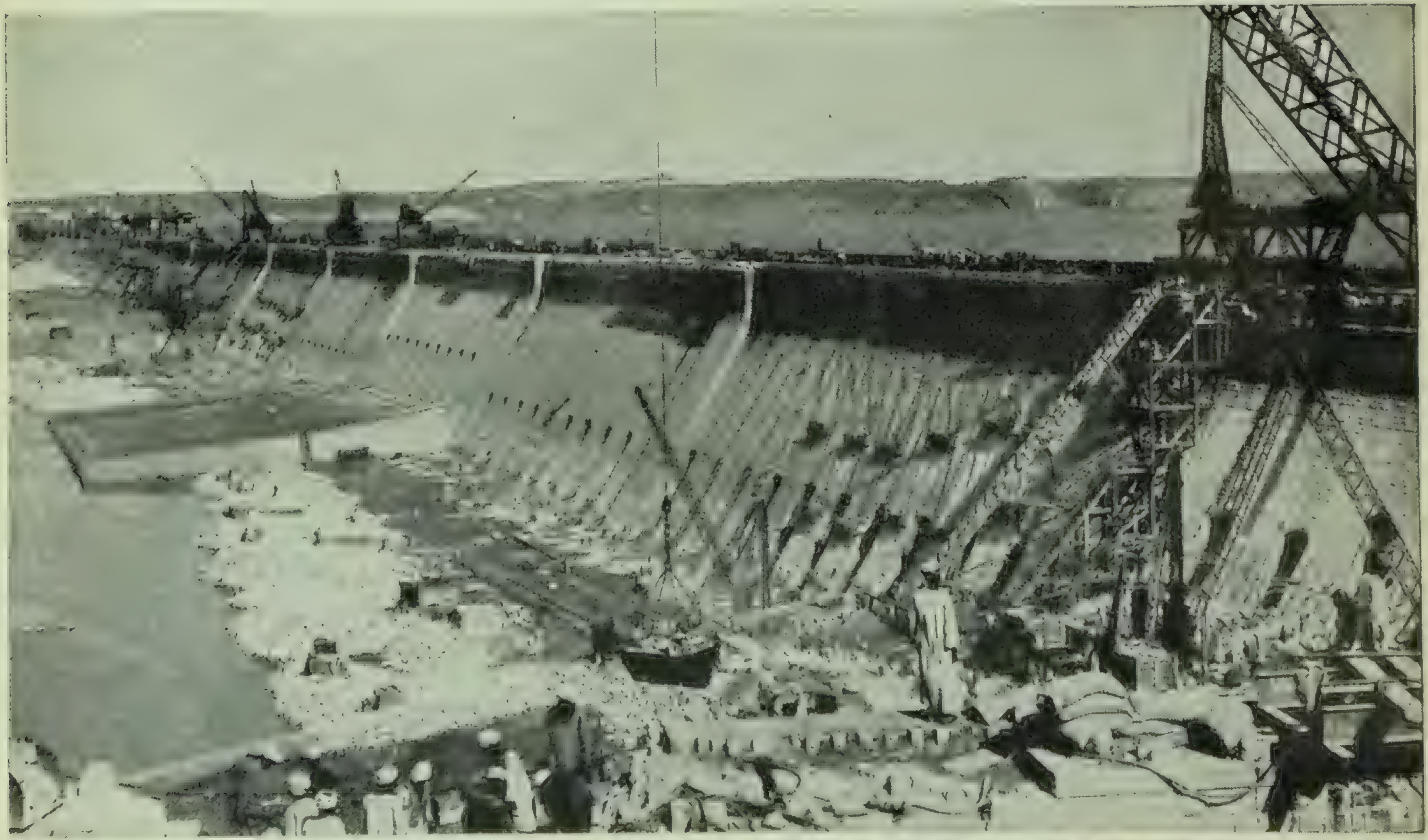
THE DAM HAS GIVEN LIFE TO OVER A MILLION ACRES OF HITHERTO DESERT LAND.

The cement was delivered into the space by flexible piping, after two years had been allowed to ensure that the temperature had settled down. When the thickening had been satisfactorily completed, it was an easy matter to raise the height of the dam by building on the top of the structure.

As already stated, when first completed this great retaining wall was capable of holding back 1,000 million tons of water, eighteen times that contained in the Vrynwy Reservoir for the supply of Liverpool. When the additional 23 feet were added in 1912 its storage capacity was increased to 2,500 million tons of water, bringing over a million acres of hitherto desert land under cultivation.

HOW THE RICH LAND OF EGYPT WILL BECOME EVEN MORE FERTILE.

Now the dam is to be raised a second time. Another thirty feet is to be added to its height and, as before, the whole structure strengthened from the foundations upwards by additional masonry. The contractors for the work and the consulting engineers are British firms, for British plans and British workmanship are world-renowned. When completed the great retaining wall will have a total height in some places of 173 feet and be capable of storing about 4,800 million tons of water, sufficient to supply the domestic needs of a city like Birmingham, of a million population, for about 115 years. The stored water will form a huge lake 230 miles in length, equal to the distance from London to Bodmin in Cornwall. It should prove the means of adding nearly a million acres to the fertile lands of Egypt.



The Assuan dam has provided work for many busy hands, to raise its height an extra 30 feet. The width on the top of the finished structure is 36 feet. The picture shows both men and cranes busy at work on this great undertaking.

EVEREST—THE UNCONQUERABLE MOUNTAIN

IN the Himalayas, the core of the great land mass of Asia and Europe, is the highest mountain in the world, so far unconquered by man, although many expeditions have set out to reach its towering peak. It is called Mount Everest in honour of the famous surveyor-general of India, Sir George Everest, who first located it and calculated its height, 29,002 feet, almost a hundred years ago. Not until 1921, however, did a band of British mountaineers actually make the attempt to reach the summit. They got to within 6000 feet, but had to give up owing to exhaustion and frost-bite. The air, too, is so rarefied at these heights that apparatus for supplying oxygen to the climbers had to be carried, which added to their difficulty. Mallory and Irvine, who were last seen at a height of 28,000 feet, lost their lives in gallantly struggling to scale this peak, almost six miles above the sea level. The upper mountain is a region of ice and snow, all the year round, and great glaciers, such as the Rongbuk on the Tibet side, creep slowly to the valleys below.

Some idea of the mountain's height can be gathered from the fact that it would take seven Ben Nevises, one on top of the other, to equal it, while a climber on the top of Mont Blanc in the Alps would be little more than half-way up Everest after climbing the same distance. The Eiffel Tower in Paris, 984 feet high, would look as short by comparison with this monarch of the mountains as your aerial-pole would beside Eiffel Tower!

THE MIGHTY AMAZON—A FLEETING GLIMPSE

An Indian family spend a sunny hour in their dug-out canoe, on a backwater of the mighty Amazon river. [*E.N.A.*

IT is difficult for us who are apt to think of the Thames as the most important river in the world—which it doubtless is so far as shipping is concerned—to imagine the greatness of the Amazon in South America, the longest and mightiest on the globe. The Amazon is as wide at its mouth as a quarter of the entire length of the Thames, and its length is estimated at almost 4000 miles, so that it is really longer than the Mississippi, which is sometimes called the largest river because with its tributary the Missouri it is over 5000 miles.

The river rises in Lake Lauricocha in the mountains of Peru, and cuts through the Andes in a series of deep gorges till it reaches the great, almost unexplored, forest-plains which lie between the foothills of the mountains and the Atlantic. The main stream and its

Dense jungles border the great Amazon, the longest river in the world, and many queer creatures make their home on the banks and in the waters. Hungry alligators swarm in the fever-infected area, and turtles and large fish are found in great numbers. Its length is estimated to be almost 4000 miles. [*E.N.A.*

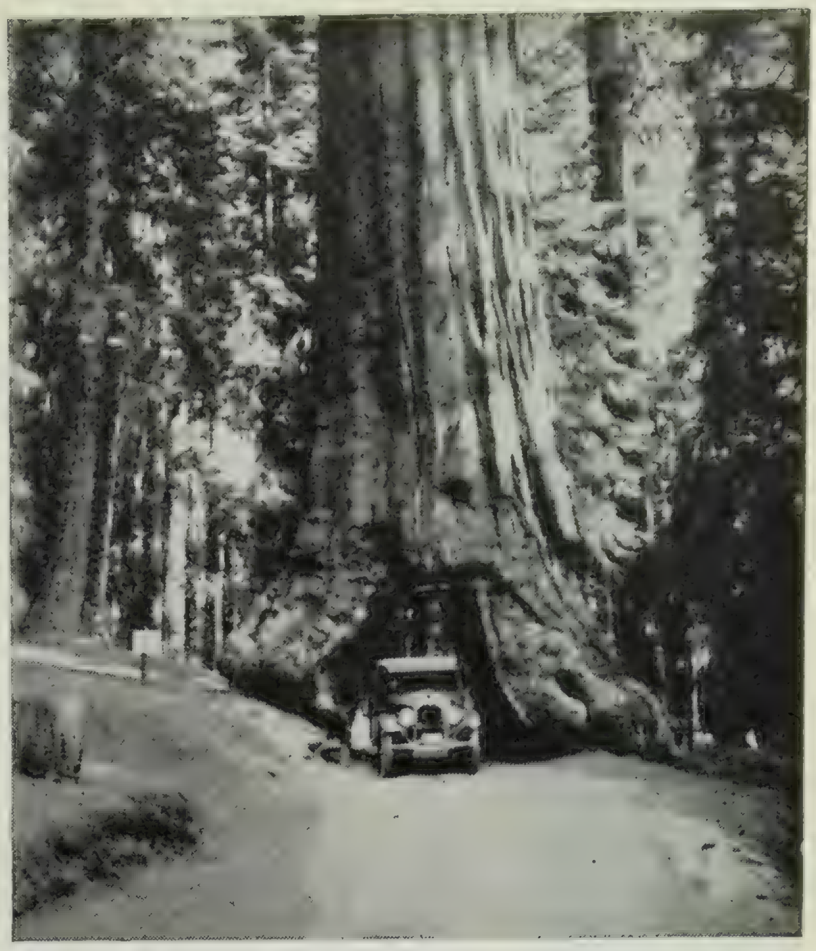
tributaries drain an area about two-thirds as large as Europe, and it is small wonder, therefore, that the water in the Atlantic is still fresh over 200 miles out from the mouth. The river, which is tidal for 400 miles, is comparatively slow flowing—2¼ miles an hour—and with its tributaries affords steamboats about 25,000 miles of safe waterways, which are little used, however, on account of the extreme tropical climate. Dense jungles clothe the banks, so luxuriant that the light of day scarcely gets through, and peopled only by a few savage tribes. The stream itself teems with alligators, turtles and fish of all kinds, and on its fever-infected waters ply the little ships that bring supplies of ipecacuanha, quinine, vanilla, coffee and sugar to the great trade routes of the world.

It is not always smooth sailing on the Amazon, as the picture shows. Many different types of water-craft find their way over the river, carrying goods to the trade routes. Savage tribes dwell on the heavily-wooded banks, and seem to revel in the intense heat. The river passes through some of the world's most fearsome forest land. [*E.N.A.*

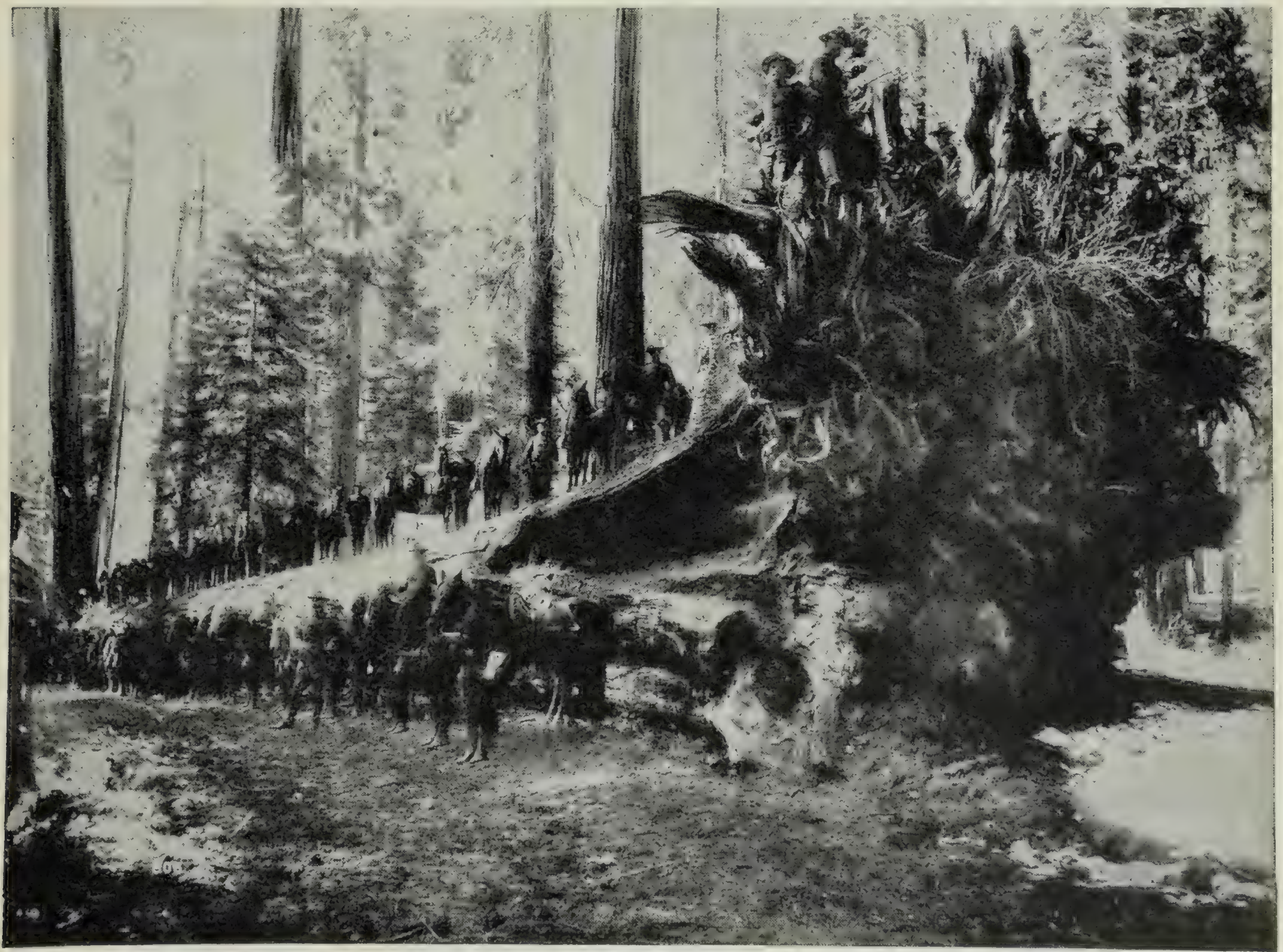
FOREST KINGS THAT WITHSTAND THE AGES

IN California grow the tallest and most wonderful trees—the giant Redwoods or Wellingtonias. They are first cousins of our pines and firs, and bear cones like them. But a seed planted to-day would take probably five thousand years to grow to a tree of the size of some now living in California ! They are the oldest living things on the face of the globe —and the highest. Quite a common specimen is twenty feet in diameter and it takes twenty men with joined hands to encircle the giant of them all known as " General Sherman." They have been found over 340 feet high, at least three times the height of the biggest tree you've seen in this country, and at least as high as a church spire. The leaves are small and scale-like, and overlap on the branches and twigs. It has been calculated from the growth rings that one specimen was over 3000 years old.

It seems wrong to fell such wonderful trees, but one has been known to produce ten thousand planks of perfect timber each ten feet in length, and the world needs all it can get.



Motoring through the heart of a tree. In a grove of giant Redwoods—the tallest trees in the world—the motorist finds it quite easy to pass through this tree-trunk arch.
[W. F. Taylor.



Many centuries have passed since this tree first waved its branches in one of the large Californian forests. Age, however, has at last withered the aged monarch and sent it crashing to the ground, where, as the picture shows, it forms a quaint parade ground for some of Uncle Sam's troops. Even the horses find the trunk a safe resting-place.

One of the greatest and most beautiful waterfalls in the world—the Sutherland Falls in New Zealand. It is ten times higher than the great Niagara Falls, but has not such a powerful rush of water. [*E.N.A.*

Lake Superior is the biggest of the group of Great Lakes in North America, between Canada and the States. It is the largest body of fresh water in the world, being 412 miles long, about as far as from London to Glasgow, and 167 miles broad, while the area is practically the same as that of Ireland. The water is very pure and clear, and has never been known to freeze over entirely, although the shores are ice-bound most of the winter. The lake is tidal and storms occur frequently, as terrible as those in the ocean itself. Waves almost twenty feet high have been seen during autumn gales.

Many curious grain-carrying steamers ply down the waters of the lake, taking their cargoes to the Atlantic coast. They pass on to Lake Huron through the Sault Ste. Marie Canal, which boasts the longest lock in the world, and through the gates of which Canada sends us the greater part of our grain supply, shipped from the prairies at the busy ports of Lake Superior.

THE WORLD'S BIGGEST ROOM, WHERE MILLIONS OF PARCELS ARE HANDLED.

London claims to have the world's biggest room, and it is serving as a post office at Mount Pleasant. Here the parcels posted in a great part of London are dealt with and also thousands which come in each day from the provinces. It is a strange sight when all the lamps are burning, particularly when a fog rolls up. This great parcel office then appears bigger than it is. Adjoining it is a platform where the vans come along and discharge their burden of parcels. They are tipped into chutes below which is an endless band. When all is going well there is a green light burning, but should a parcel refuse to travel underground another tell-tale light is shown, and what is very remarkable, it will indicate to the man in charge where exactly the stoppage has occurred. The parcels travel from the loading platform to the big room, and then they have to travel up an inclinend a afterwards along a raised platform. Here two men are stationed ; either of them can touch a lever and a scoop arrangement sends a big batch of parcels down a wooden slope at the foot of which many sorters are at work. These drop the parcels into rubber-lined cavities, labelled for various divisions, and this is the only man-handling the parcels get up to this stage. At the foot of each of the cavities is another moving band and underneath the big sorting office the parcels go on their journey to come up into their proper division where they are sorted for despatch.

UNDERGROUND CAVERNS, WHERE BEAUTIFUL CRYSTALS HANG FROM THE ROOF.

The mammoth caves in Kentucky are supposed to be the largest in the world, although it is possible that still vaster underground chambers await to be discovered. Here a visitor may easily get lost in the 150 miles of passages and tunnels, grottoes and great vaulted avenues. The roofs and walls are covered with crystals of untold beauty, while in the subterranean lakes and rivers swim strange fish whose eyes have long been lost through darkness. The chamber called Echo River, the most famous, is three-quarters of a mile long and here sounds are prolonged for thirty seconds. Hundreds of bats cling for shelter during the winter in the caverns, and endless other weird and wonderful things are to be seen during the nine hours which it takes to walk through this underground fairyland.

OCEAN, WATERFALL AND LAKE

THE Pacific Ocean covers more than a third of the whole of the surface of the globe, and all the land in the world could be put into the area it covers. The average depth is about two and a half miles, but a little German ship called the *Planet* took a sounding near the Philippine Islands of over six miles! In other words, in this part of the Pacific, known as the Swiré Deep, Mount Everest could be put completely under water! So wide is the surface of this ocean that five times more water falls directly into it as rain than is poured into it by the rivers from North and South America, Australia and Asia put together. While we are inclined to think of the Pacific as being dotted with sunny coral islands, we must remember too, that across it float the icebergs of the Antarctic, and to its shores come not only the Hawaiians with their guitars, but fur-coated Alaskans of the frozen north, so extensive is this mighty ocean.

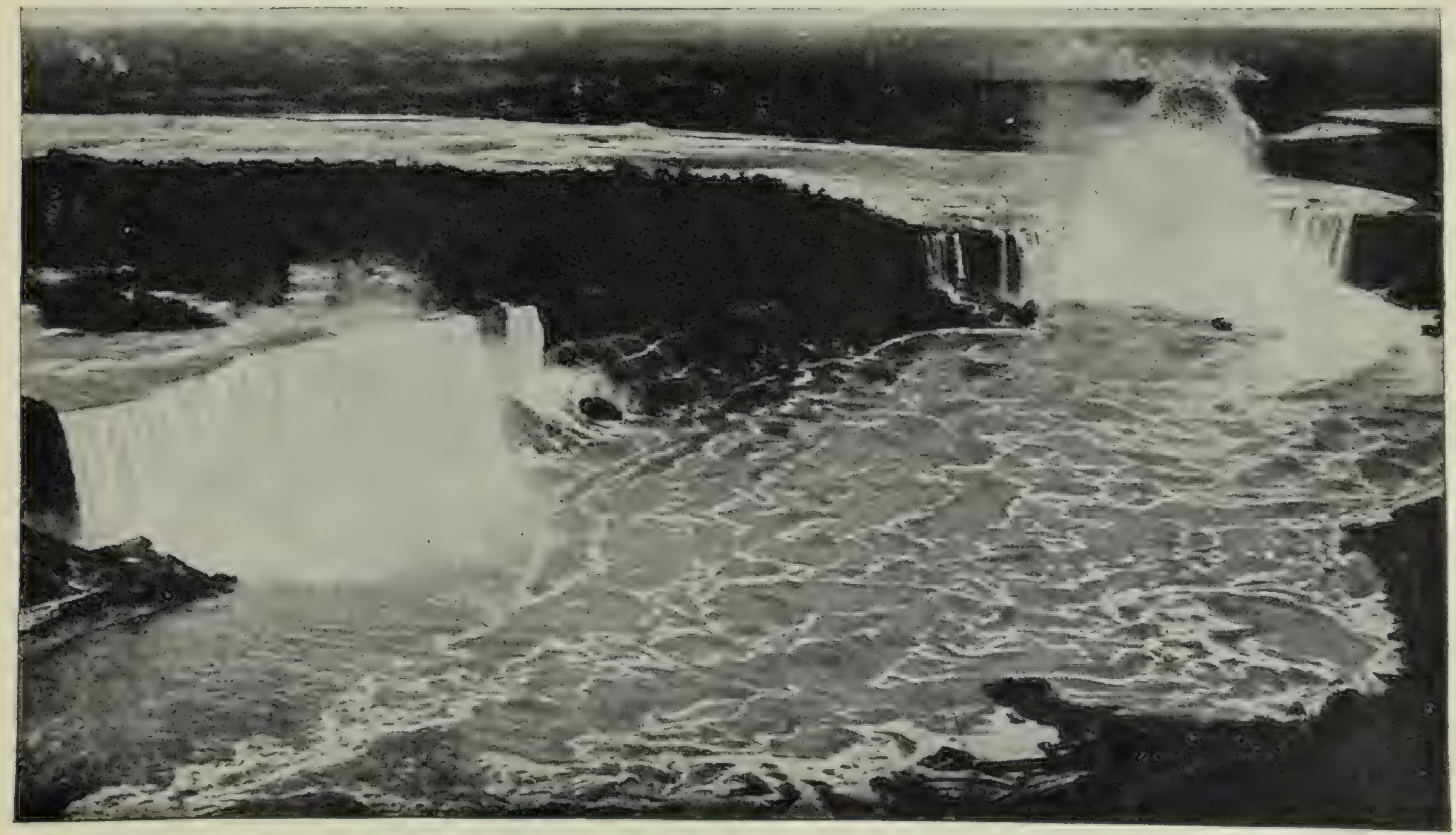
WHICH IS THE GREATEST WATERFALL AND WHICH FALLS FARTHEST?

Between Lake Erie and Lake Ontario, forming part of the boundary between Canada and the United States, is the Niagara River, thirty-six miles long. This river has to descend in that distance about 330 feet, which it does in seven miles of the most spectacular rapids in the world, and before that in a divided cataract which is perhaps the most famous waterfall in the world. The cataract is divided into the Horseshoe and American Falls by Goat Island, one of the several islands in the river.

You can easily realise why the Indians named this Niagara, or "Thunder of Waters," as fifteen million cubic feet of water tumble into the gorge below every minute of the day. Think of this roughly as forty-five million cans of petrol! So great is the roar that sometimes visitors for miles around can scarcely sleep at nights.

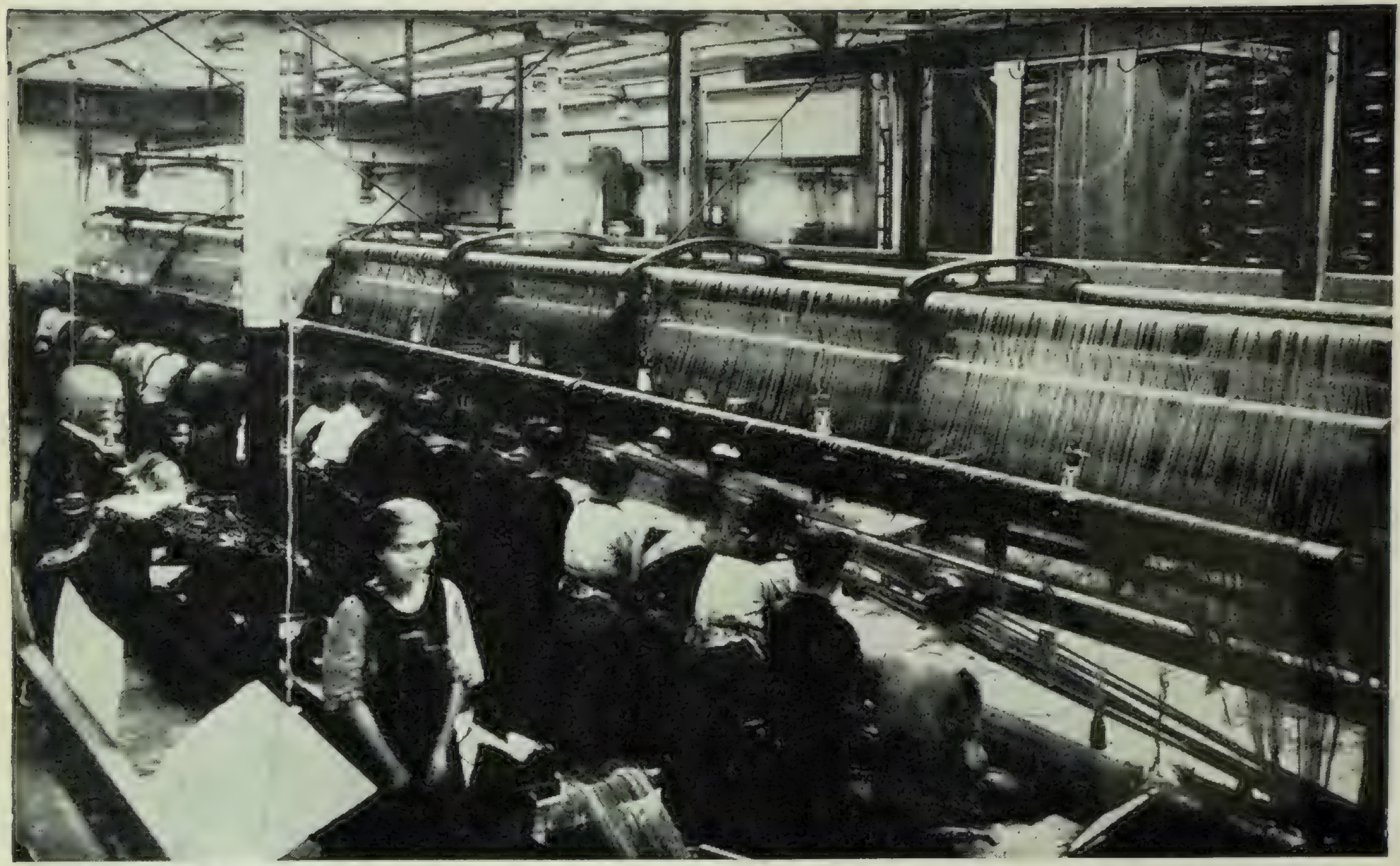
THE ELECTRIC POWER THAT COMES FROM THE MIGHTY WATERFALL.

The actual drop is 158 feet or so, and the depth of water at the edge is about four feet, except in the middle of the Horseshoe or Canadian Fall, where about twenty feet of water is rushing over. But it is the amount of water and its power, rather than their height, that make Niagara Falls the grandest in the world. In point of fact, the Sutherland Falls in New Zealand, the highest known, is more than ten times higher. But Niagara remains the greatest example of water-power in the world, and this has been utilised to generate electricity for many of the great cities in Canada and the States. Crowds come from all parts of the world to admire this wonderful sight.

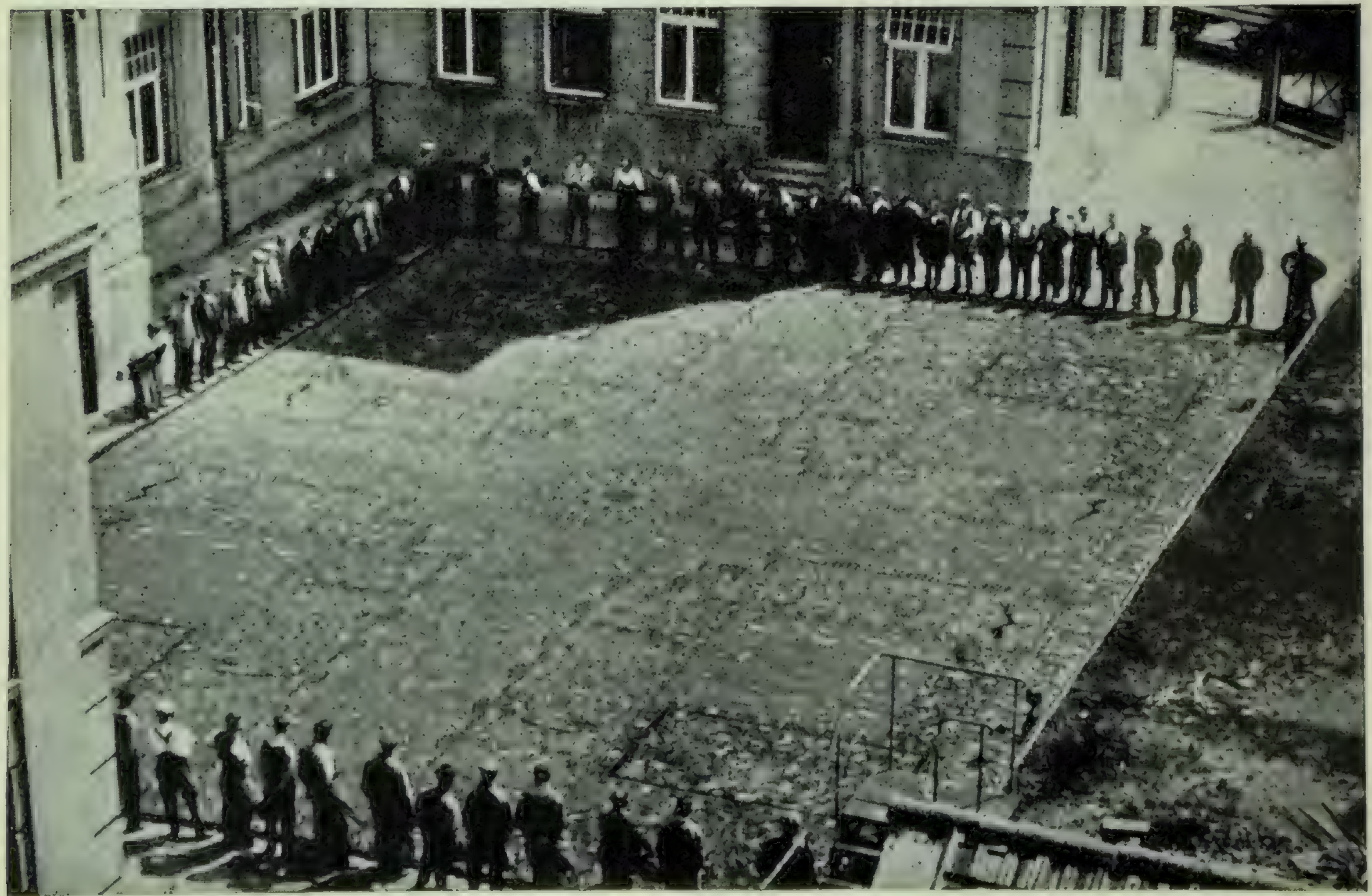


The Niagara Falls thunder down on the borderland of Canada and the United States. The left-hand fall is in the U.S.A., while the one on the right, known as the Horseshoe Fall because of its shape, is in Canada. [*C.N.R.*

MAKING THE WORLD'S LARGEST CARPET

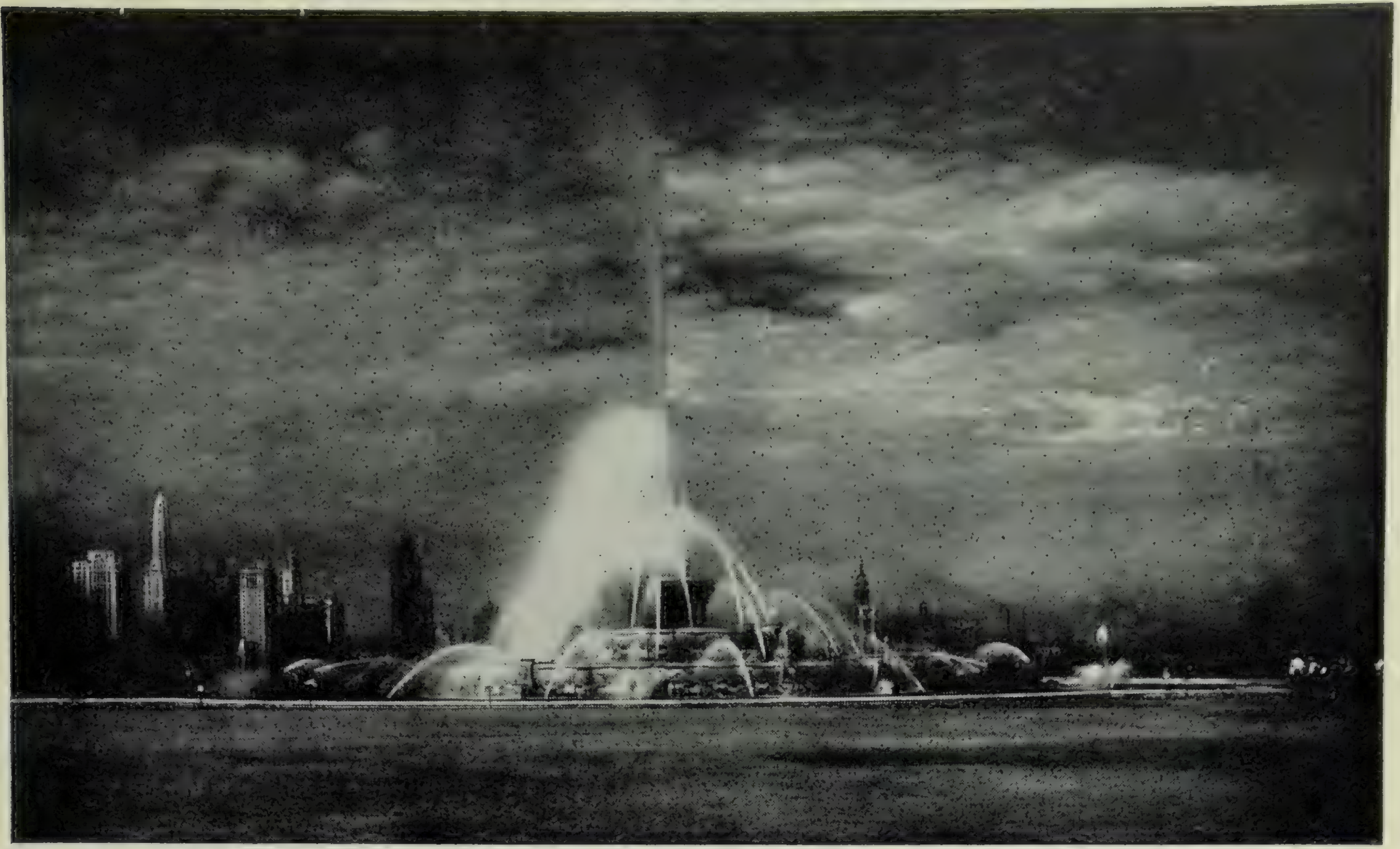


To make a carpet for the main lobby of the new Waldorf-Astoria Hotel, in New York, thirty weavers were kept busy for ten months. It is 70 feet 2 inches long by 49 feet 11 inches wide, and is so beautifully designed that it attracts the admiration of every visitor who enters the palatial hotel. The loom on which this giant was born is the largest in the world.



The great hand-tufted carpet, made in Maffersdorf, Czecho-Slovakia, undergoes a last inspection before being despatched to its new home in New York. The design is carried out in garden plots of blue, red and gold, with a central pool from which four canals, represented in soft green, emerge at right angles. There are fish, duck, and water-lilies on the pools, and trees and flowering plants arranged as in a garden, in this lovely and original carpet.

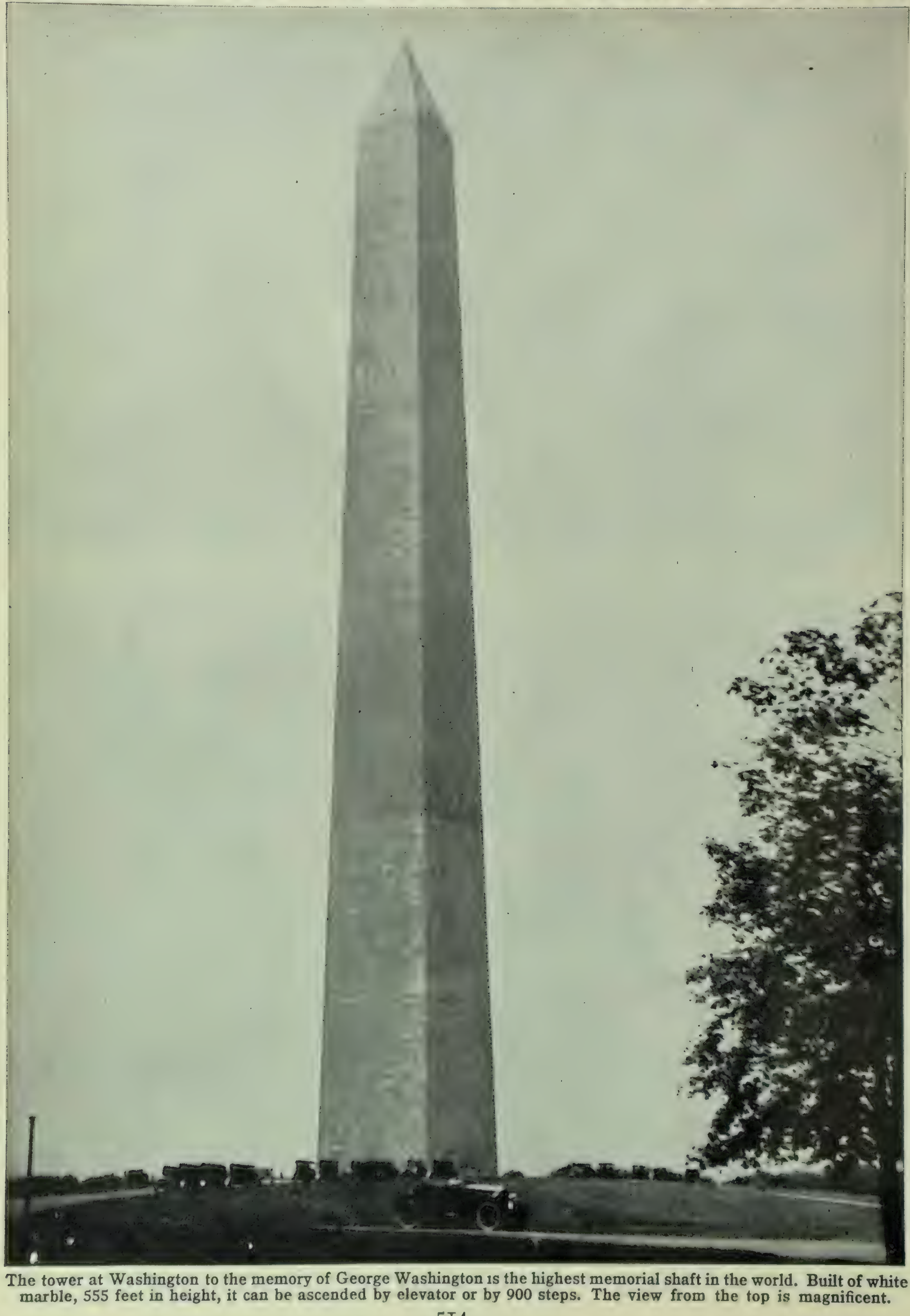
STAGGERING PRODUCTS OF MAN'S SKILL



This tremendous fountain, with its scores of jets, and sending its central spray high into the air, is situated in Chicago. It is supposed to be the largest fountain in the world, and when floodlit is a wonderful sight.

The world's largest carpet being carried by a crowd of men to a special double-car for transportation via Hamburg to New York. The great Waldorf-Astoria Hotel, which is to be its new home, is worthy of such a giant carpet. There are forty-seven storeys in this unique hotel, with twin towers reaching to a height of 625 feet 7 inches.

THE WORLD'S HIGHEST MEMORIAL COLUMN



The tower at Washington to the memory of George Washington is the highest memorial shaft in the world. Built of white marble, 555 feet in height, it can be ascended by elevator or by 900 steps. The view from the top is magnificent.

Who could help being healthy with the sea and the sun conspiring together to send a glowing tan over their bodies ?

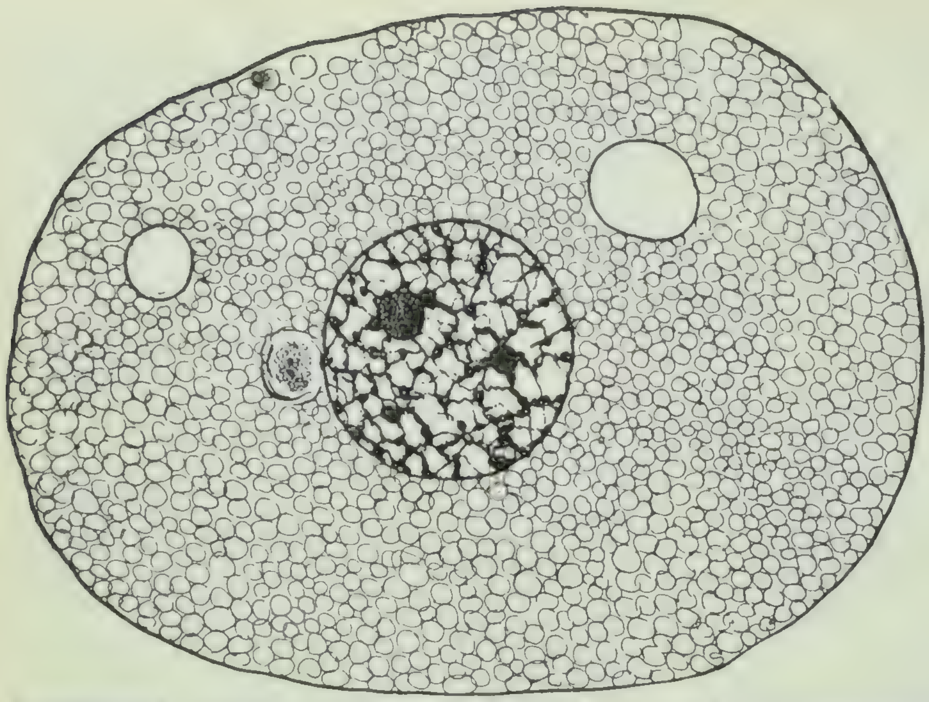
ABOUT OURSELVES

" Health and happiness go hand in hand," is an old and very true saying. To-day we are doing our best to keep the health flag flying, and to do this we have found that we must look to Mother Nature for help. We have discovered the healing powers of pure air and sunshine, and are finding that exercise in the open air is one of the best aids to perfect health. If we learn about the various parts of our body, too, and their functions, we know better how to keep it fit. Below we read of the wonder of human life—how life grows from tiny cells, and how our bodies are fitted with bones, and brains, and muscles, and all the wonderful organs necessary to keep us alive. If you want health and happiness, read on.

WHAT is the most wonderful thing in the world ? Is it the aeroplane which flies twice as fast as the fastest bird ? Is it the wireless which carries your voice across the world quicker than the blink of an eyelid ? Is it the giant tree that has lived for a thousand years, or the great telescope which teaches us the mysteries of the sun and stars ? No ! It is something nearer to you than that, something you meet and live with and care for every day . . . it is Yourself ! The muscles with which you move, the bones that keep them in place, the blood which brings them energy, the network of telephones and messengers which guides them and the great central control station of the brain . . . these are the most wonderful things in the world. In the pages which follow you will read how the intricate house is made in which you live, and how the delicate machinery of your body works without ceasing, night and day.

All living animals, including ourselves, are made first of all from a soft jelly-like substance which is called by scientists *protoplasm.* It is sometimes referred to as the *essence of life,* for it is the simplest living thing and yet all the wonderful structures of our body are built up from it. At least three-quarters of this substance consists of water, and it is surprising to think, when we consider how strong and solid our bodies are, that if we could separate the water from them we should have only one-quarter left.

Protoplasm does not exist in a solid mass, but is composed of innumerable tiny globes, or cells. Just as a house is built up from bricks, so the human body is built up from minute bricks or cells of protoplasm, each cell so small that it can be seen only through a powerful microscope. Unlike the bricks of a house, however, the cells are formed in several different shapes and sizes, they must have *food* to keep them alive and they are able to *grow.* Also they can increase in number, which they



A section of a simple cell, which consists of a mass of protoplasm with a foamy structure, surrounding a central nucleus.

do simply by dividing into two, the parts, when they are full grown, each dividing again into two and so on.

HOW THE HUMAN MACHINE RUNS DAY AND NIGHT WITHOUT RESTING.

Just as when a big house or factory is being built each workman is given a special job to do, so the different cells in the body each have their special work. It is necessary too for large numbers of cells to combine into groups, and each group becomes expert in its own particular work. Thus some groups enable us to see, others to hear, others to feel and taste and so on, each helping with the marvellous work which goes on continually in our bodies.

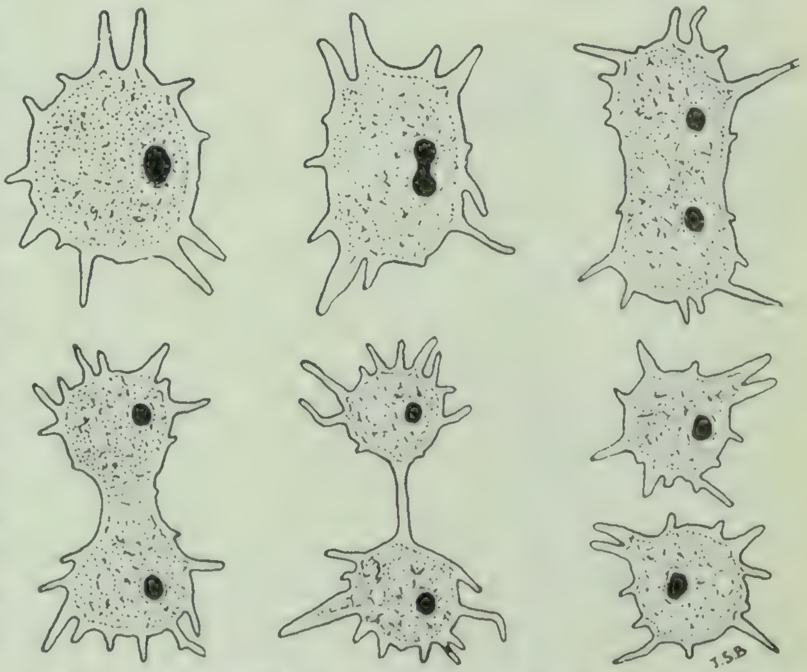
When different kinds of cells are grouped together they form what is known as *tissue*, and so we have muscle tissue, nerve tissue, connecting tissue and other kinds according to the work which is to be done. In turn, the tissue is built up into *organs*, like the heart which pumps the blood through the arteries, the liver, the stomach which digests the food, and the brain. The organs then work in connection with others, forming *systems*, and thus we have the circulatory system, which carries the blood to different parts of the body, the digestive system, the breathing system, the system of muscles by which we move, the system which disposes of waste and useless food and, last the great master system which controls and regulates all the others, the brain and the network of nerves.

It is in this way that this wonderful and complicated machine which we call our body is constructed. This machine must run without a pause, night and day, for many, many years; it must develop as we grow older, and it must maintain itself in a good state of repair all the time.

HOW A BODY RESEMBLES IN MANY WAYS A RAILWAY ENGINE.

There are a great many points of likeness between our body and a machine such as a railway locomotive. Every one knows that the engine needs coal and water to generate the steam which causes it to move. In much the same way our body needs food which is digested to generate the energy necessary for us to move and for all our activities. The engine gets rid of its waste smoke and gases through its funnel; our body, too, must get rid of its waste through the skin, the kidneys and the bowel. In both cases it is most harmful for waste to clog up the working parts; if this happens, both machines become less efficient, which, in the case of our body, leads to illness and disease. Both require the best fuel available, otherwise the power to do work diminishes; both need great care and supervision if breakdowns in the machinery are to be avoided; both must be driven with some knowledge of their working parts else the wear and tear will be unnecessarily severe.

Yet, when all is said, our body is a very perfect machine compared with the steam



The picture shows some simple cells—showing the life-giving protoplasm which spreads till it breaks apart and forms two separate complete cells.

Courtesy] [*"The Human Machine," J. S. Bainbridge* engine designed by the brain and made by the hand of man. There is practically no wastage of energy in our body machine, and it possesses amazing powers of adjusting and adapting itself to difficult conditions. Still, as in the case of the steam engine, if we do not understand its various parts and how they work, we can do our own machine very great damage.

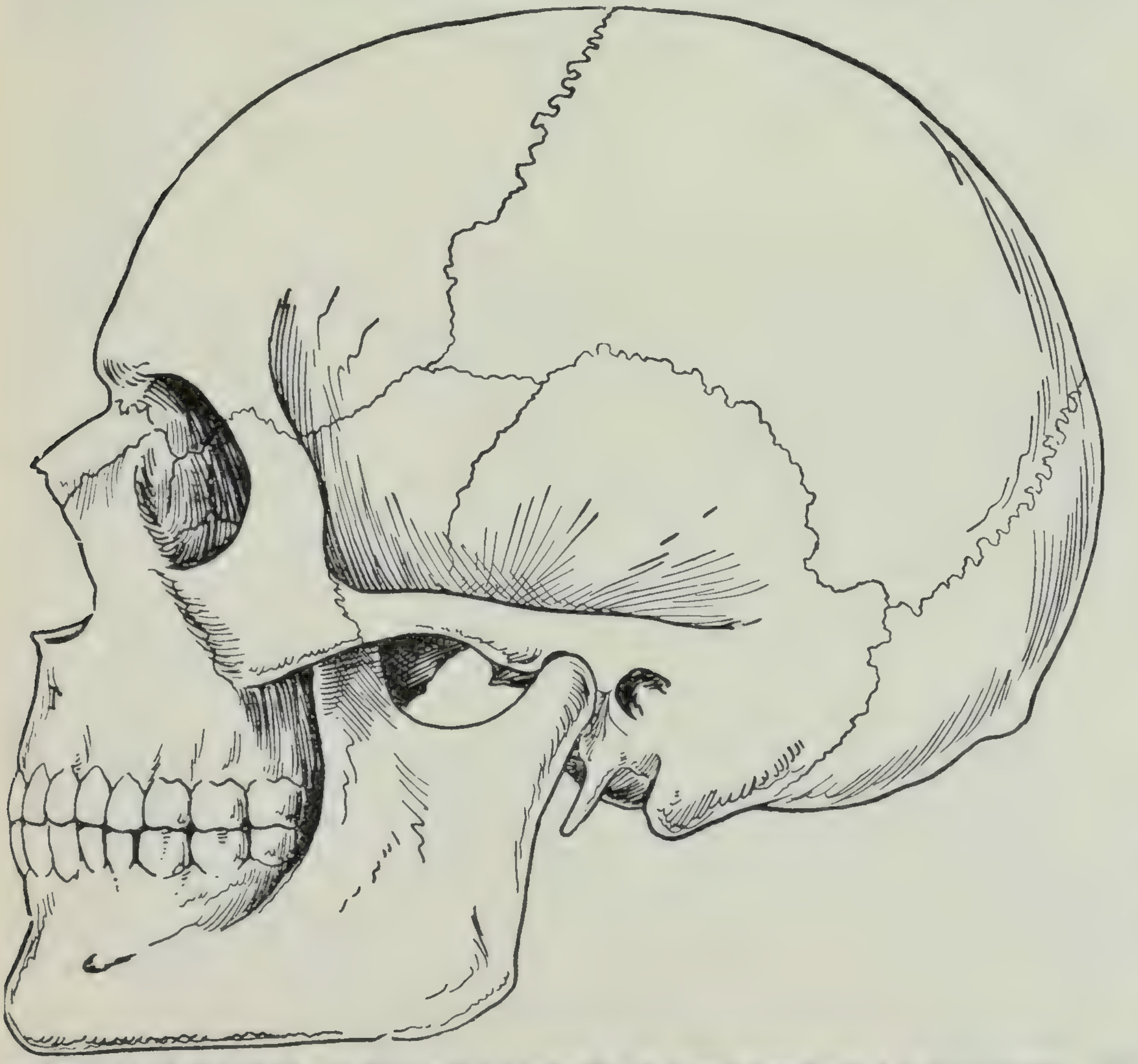
If, therefore, we wish to keep in good health, which is the first essential of a happy and successful life, we must know something of how our body is made up, and how to care for it so that it may do its work properly.

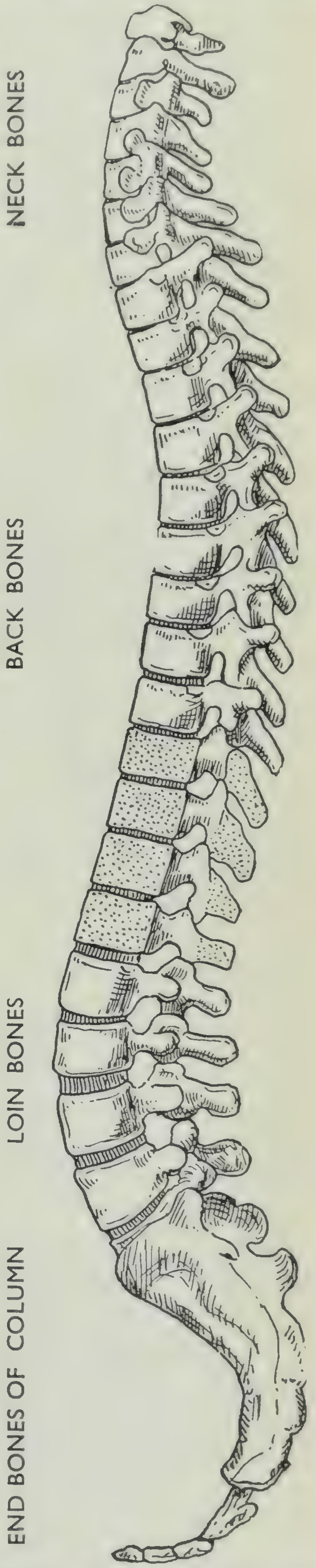
THE STURDY FRAMEWORK ON WHICH OUR BODY IS BUILT.

Man belongs to the group of the animal kingdom which is called *Vertebrate* or "backboned," that is to say, the trunk of our body is supported by a chain of small bones, one on top of the other, and each jointed to the next one, the whole being called the *vertebral column*. Between the bones there are pads of gristle known as cartilage, which make this column flexible and enable us to bend our trunk forwards, backwards and sideways.

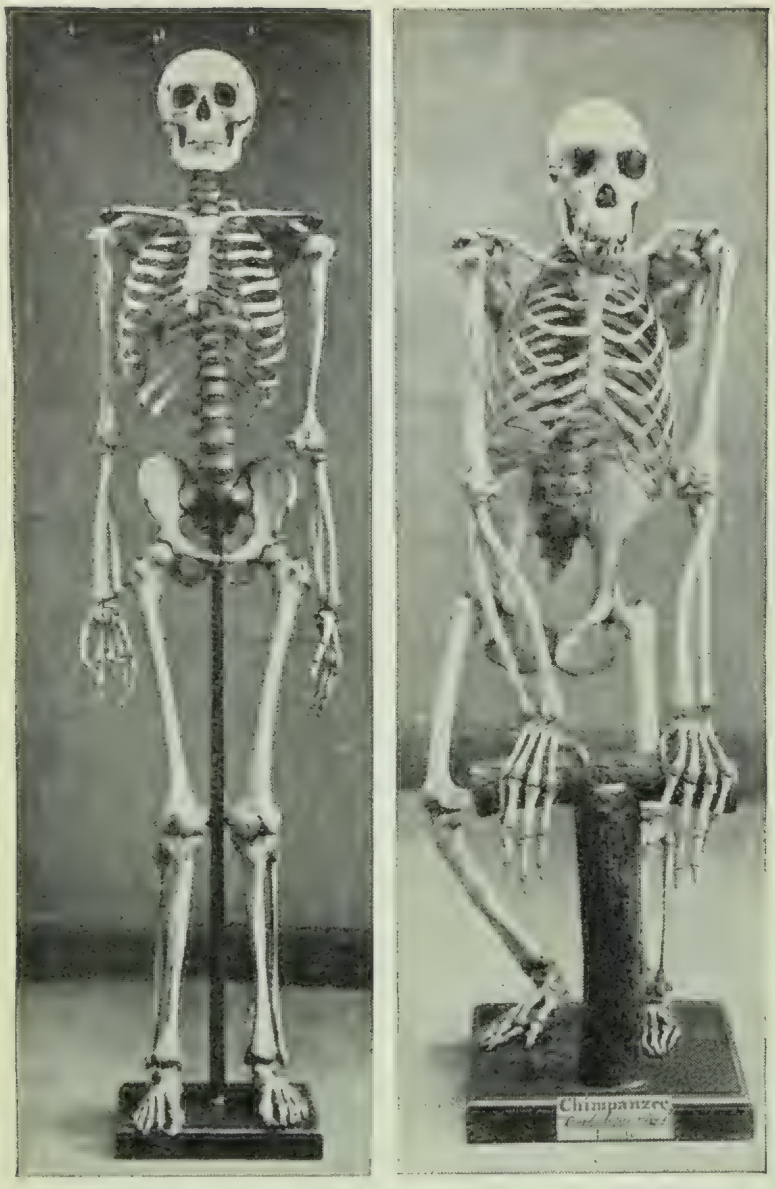
On top of the column is the skull, which consists of a number of flat bones and forms a case to protect the brain. At the lower end is a girdle formed by the hip bones, to which the leg bones are attached, while the twelve pairs of ribs, emerging from the backbone below the neck, form a cage to protect the delicate heart-pump, and the lungs with which we breathe. Closely connected to the upper portion of the ribs are the shoulder blades and the collar bones, to which are attached the bones which form our arms.

If you study a picture of the skeleton of a human being, you will appreciate how cleverly the framework of our body is constructed. It may seem hard to





The bones of the skull are flat, and all except the lower jaw bone are immovable. The backbone or spinal column has four curves, unless when diseases cause abnormal ones to develop.



The skeleton of a human being and a chimpanzee (reduced to the same size for comparison) showing the changes produced in man's skeleton by upright posture.

believe, but there are no fewer than *two hundred and six* bones in all! All have important work to do, some to protect delicate organs, others to enable us to move by the action of the muscles, and all of them are strong and rigid to keep our body firm and each part in its proper place. When we consider how hard our bones are, it is interesting to remember that at least *half* of their substance is water. The hardness is due to the salts of lime and a substance like gelatine which go to make up the other half.

THE FIVE HUNDRED TRAINED WORKERS WHICH HELP US TO MOVE;

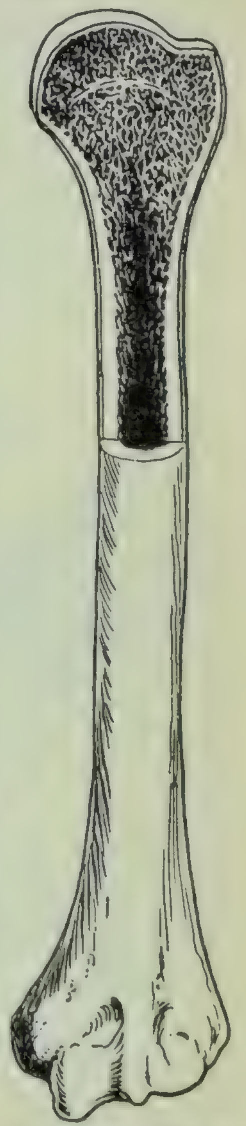
When a bone is cut in two it is seen to consist of a dense outer layer which looks like ivory. This surrounds an inner part which is spongy and seems to be hollow. Now you probably know already that a hollow iron pillar is just as strong as a solid one of the same thickness, although it is much lighter in weight. So it is with our bones. If they were solid throughout, they would be much heavier than they are, without being any stronger, and our muscles would have to do much more work to move them. Also the hollow cavities in the bone can be made use of for storing the bone-marrow, which, as we shall see, is one of the tissues which help to form the blood.

Our bodies are never completely at rest; even when we are asleep some of our muscles are working constantly to help us to breathe and digest our food. When we are awake we walk, run, dance, write, or carry out other graceful or skilful movements of our body without difficulty, and even sometimes without thinking about it. Yet every time we make one of these movements it means that scores—perhaps over a hundred—of our muscles are busily working together, each carefully doing its special part of the work without any waste of energy and just at the right moment. The human body contains over *five hundred* muscles.

HOW WE HELP OUR MUSCLES WHEN WE PLAY CRICKET OR FOOTBALL.

A muscle does its work by first contracting and hardening, and then relaxing. You will remember how the "biceps"—the muscle on the front of your arm—swells and hardens when you make it work in bending your arm. Each muscle is attached by means of a tendon or sinew at both ends to a bone, and most of our muscles act where there is a joint between two bones, and so can produce bending and straightening movements.

When we play games such as cricket or football or basketball, or when we swim or do "exercises" in the gymnasium, we make our muscles work much harder than usual. We soon find, therefore, that they are getting tired and we give them a rest to allow them to recover. Next time we make them work hard, however, we find that they are stronger and that they have learnt to work longer without getting tired. Hence if we "exercise" our muscles regularly, especially by playing games which we enjoy, we keep them strong and



Our bones have an ivory-like outer layer and a spongy interior.

HEALTH AND HAPPINESS IN THE SUNSHINE

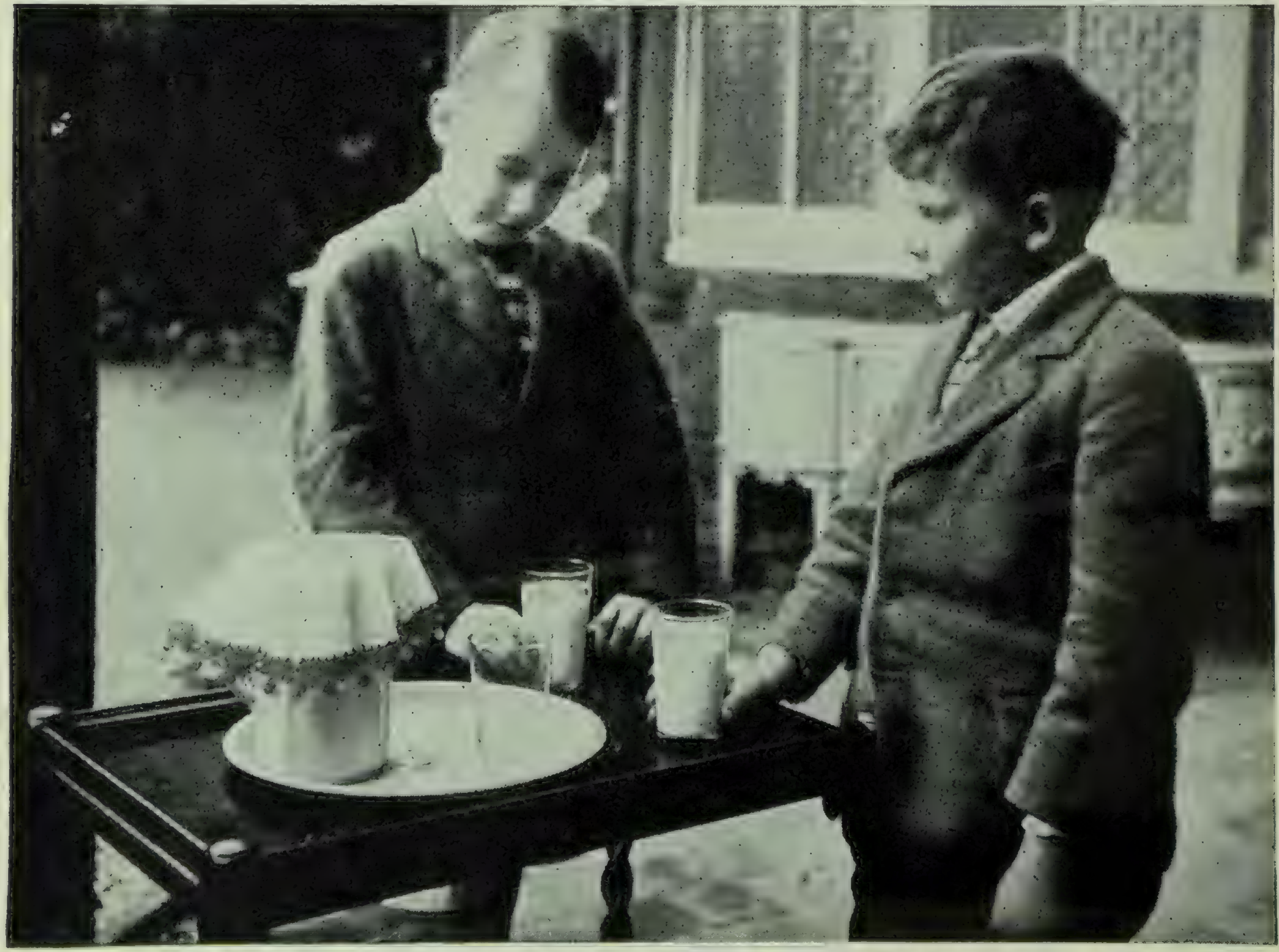
Look at the cleanest baby in the world. The New Zealand Maoris spend most of the day bathing in the hot springs.

Lucky children in a school in Switzerland are finding open-air lessons under the blazing sunshine very fascinating.

Puzzle, find the driver ! Happy children forsake school for a day in the open, to capture the health-giving sun-rays.

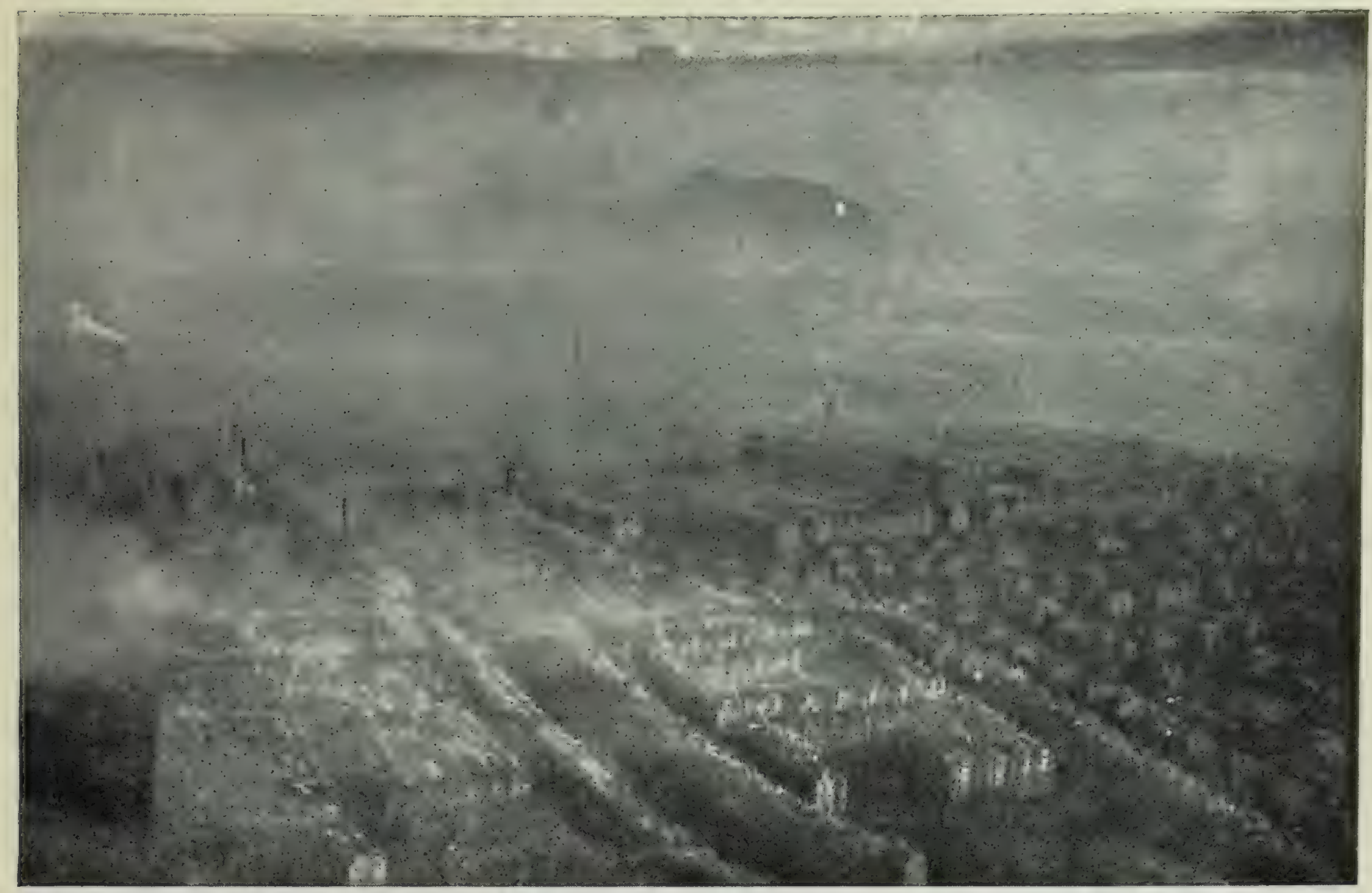
FRUIT AND MILK—NATURE'S HEALTHY FOODS

Little Miss Eve has evidently heard the slogan, " Eat More Fruit," and heartily agrees with it. She is determined to keep the doctor away at all costs, and modern children are following her example, and are gaining in health and strength.

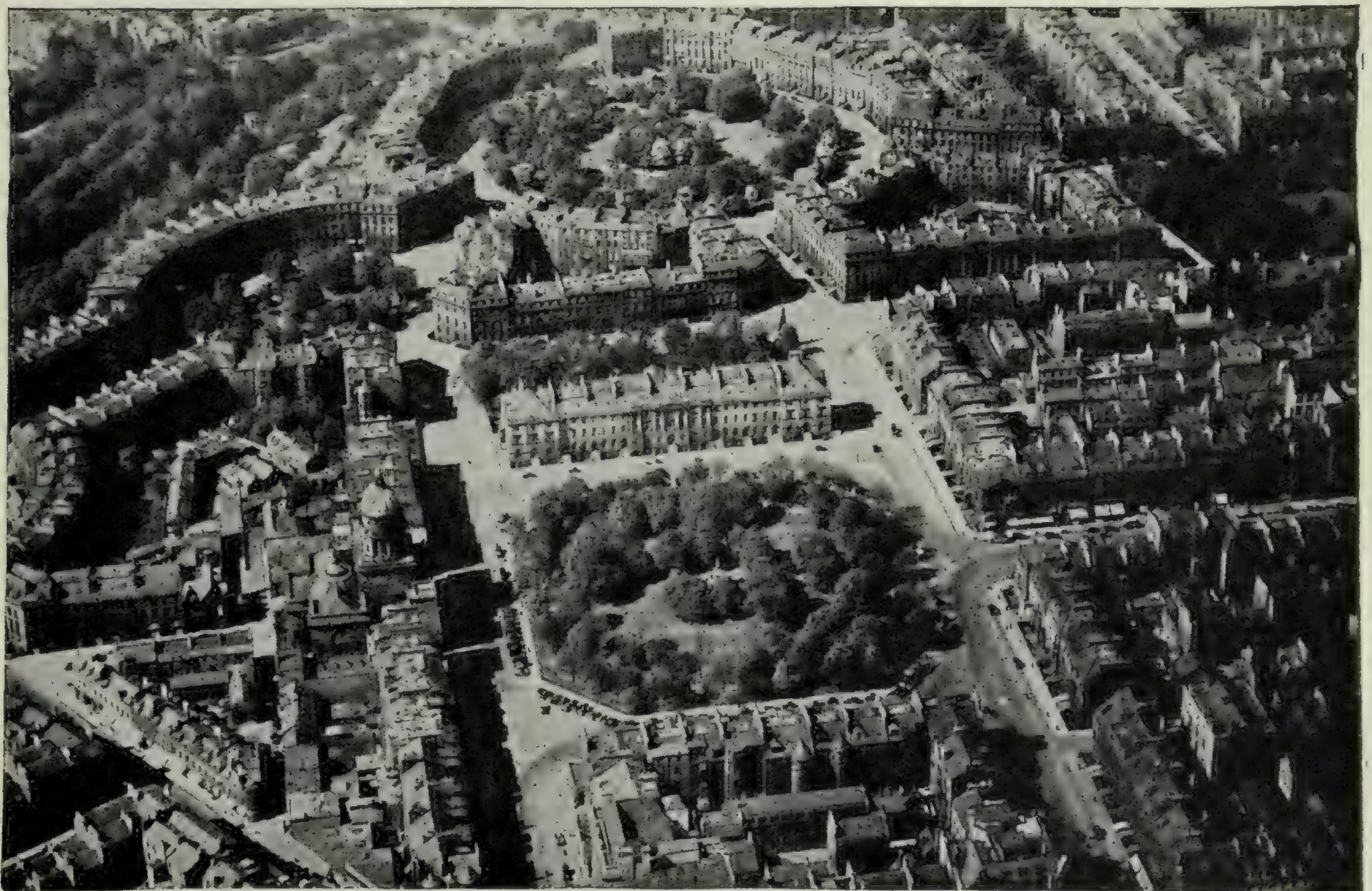


" Here's health! " As important as fresh air is good, carefully-chosen food. We have discovered that milk is a most valuable item of our diet. It contains vitamins that build up strength and add health and vigour to our bodies.

CHEATING A CITY OF ITS SUNSHINE

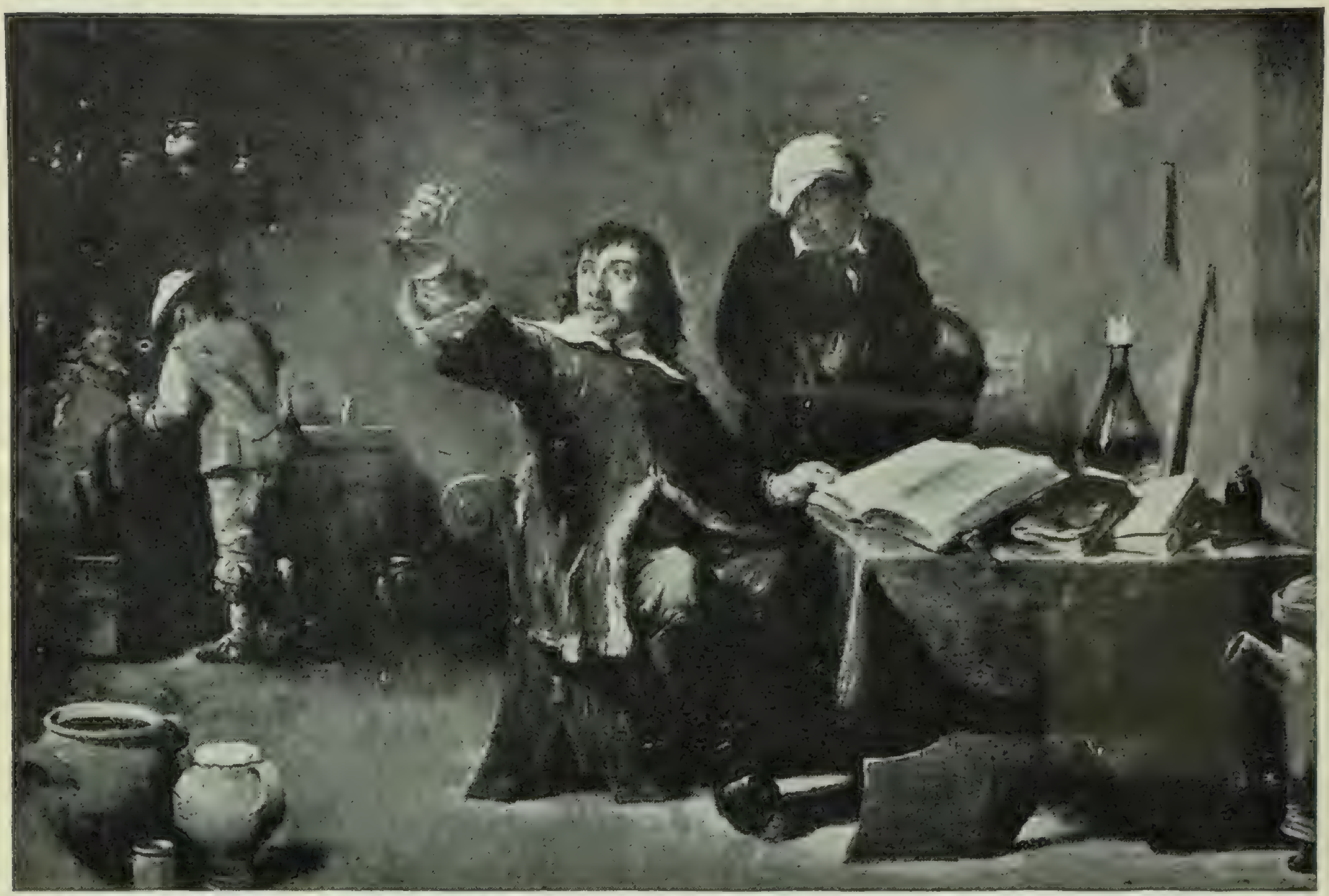


One of our most deadly enemies is the fog and smoke that descends on our big cities, spoiling their beauty, and shutting out the sunlight and fresh air. It is difficult to retain perfect health in such an atmosphere. The picture shows a view of Edinburgh under a dense pall of smoke from the thousands of chimneys huddled close together.

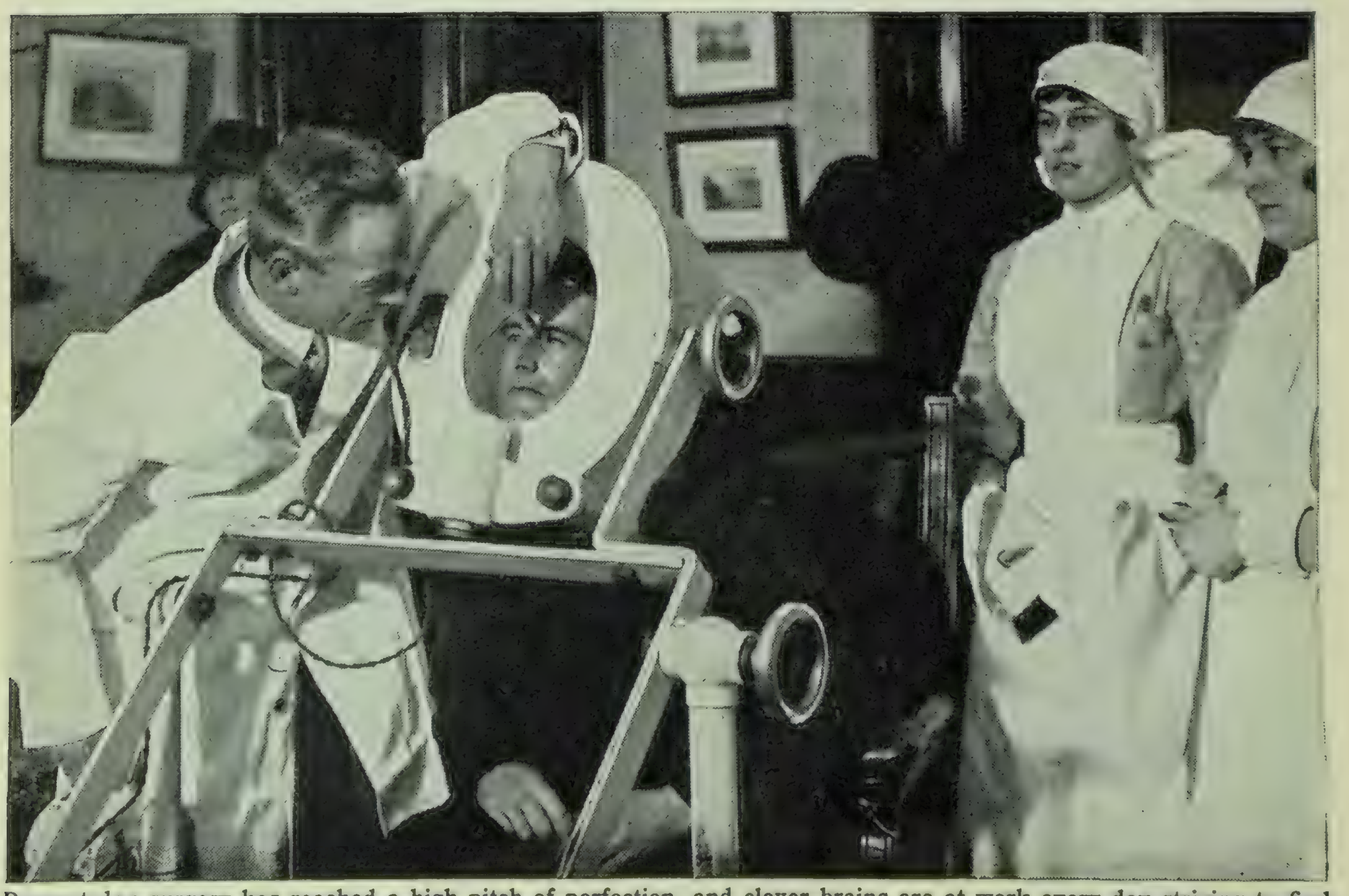


When the warm smile of summer beams over the city, the atmosphere brightens and the smoke slinks away as though ashamed. Nature awakens to fresh life and activity at the touch of the sun's rays, and the town-dwellers revel in the health-giving warmth and clean, pure air. It is hard to believe that both pictures are of the same town. [*Aerofilms*

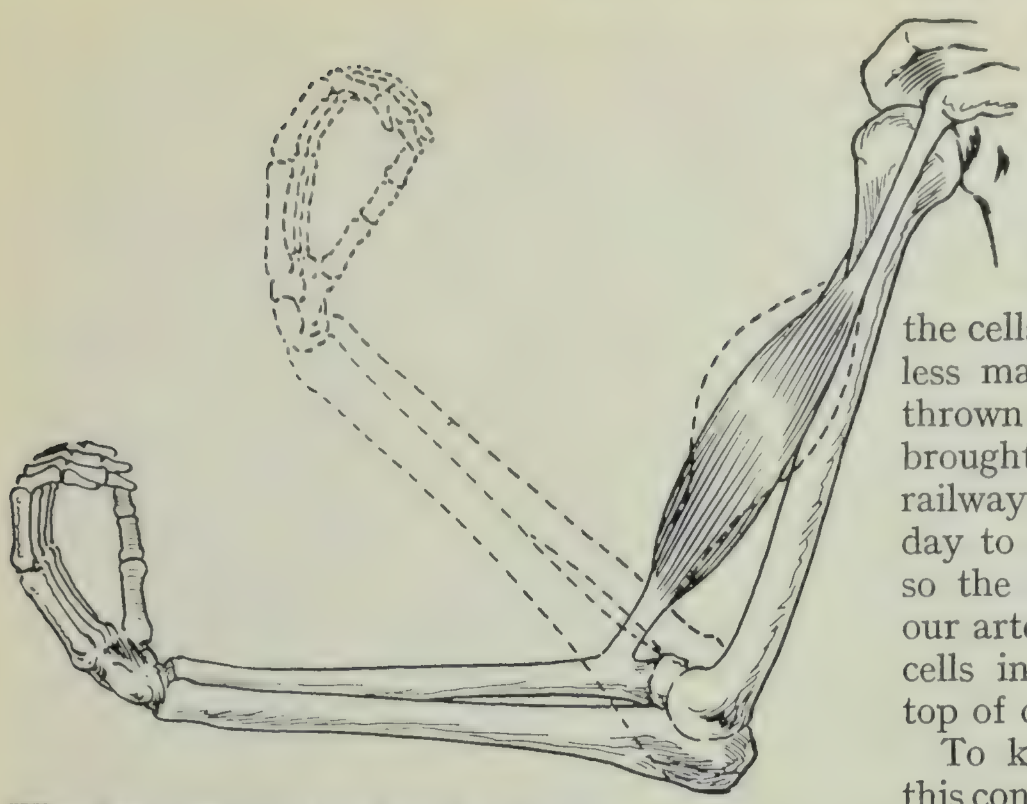
MEN WHO BATTLE WITH PAIN AND DISEASE



In olden days, before people began their health campaign, the family doctor worked under great difficulties. He had none of the modern surgical appliances and had to make up his own medicines while his poor patients waited for his help.
[*Painting: D. Teniers*



Present-day surgery has reached a high pitch of perfection, and clever brains are at work every day striving to find out new methods of easing pain and curing disease. The picture shows a demonstration of modern eye surgery.



When we move our arms about so freely, we make our voluntary muscles relax and contract to move the levers or bones.

ready to work hard whenever we want them to serve us.

HOW WE GET OUR "SECOND WIND" WHEN BEGINNING A STRENUOUS GAME.

Exercise also helps many other parts of our body to do their work properly. It keeps the heart-pump working strongly and so speeds up the flow of blood which brings food to the muscles and nerves and takes away waste and useless matter ; it makes our breathing more rapid and deeper so that we take in more oxygen—the life-giving gas ; it helps the skin to do its work and strengthens the nerves, and lastly, though not least, it keeps the brain which controls everything keen and active.

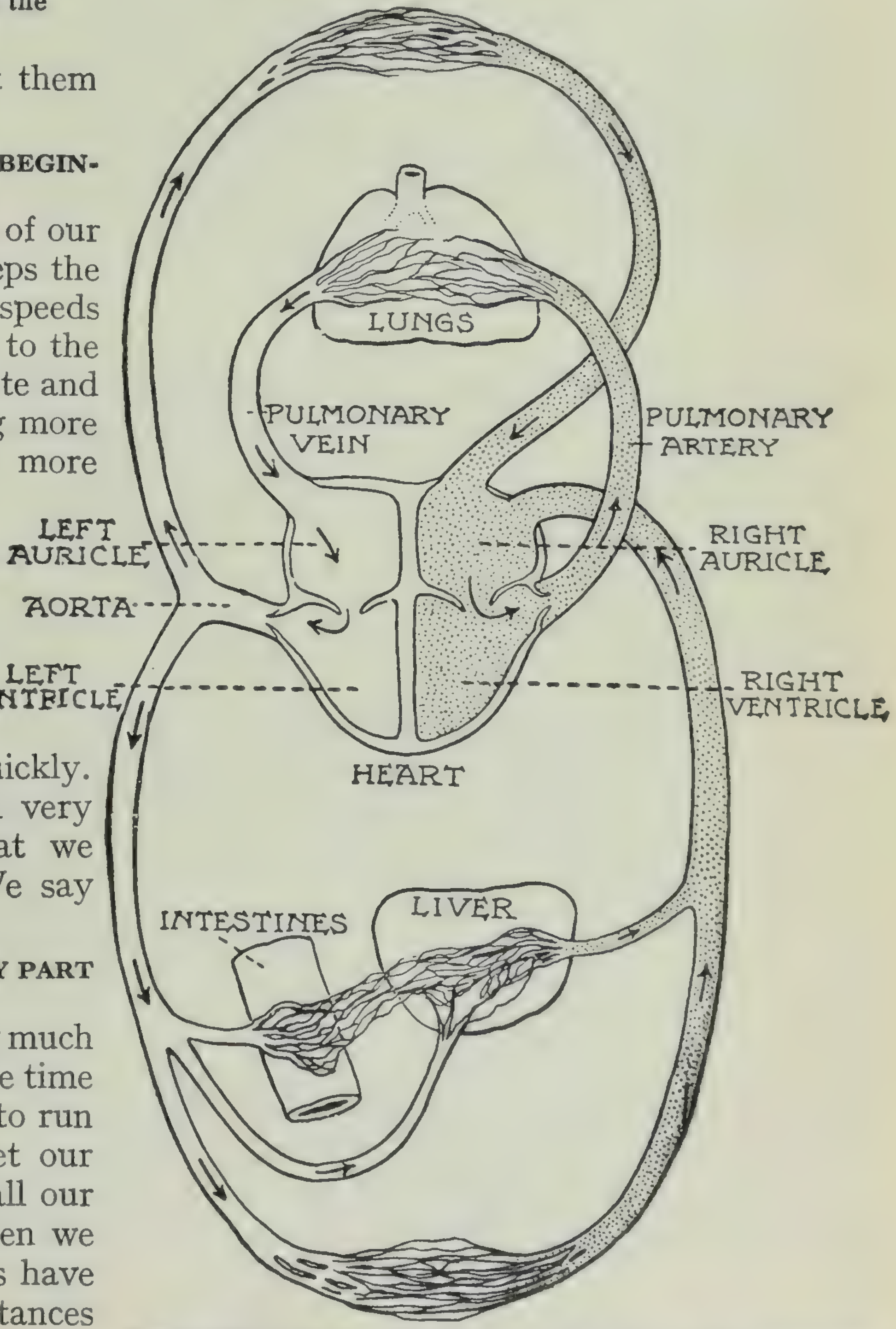
At the beginning of a strenuous race or game, it often happens that we become tired or out of breath very quickly. If, however, we go on playing, we find very soon that this has passed off and that we can go on for a much longer time. We say then that we have got " second wind."

HOW FOOD IS CARRIED TO CELLS IN EVERY PART OF OUR BODIES.

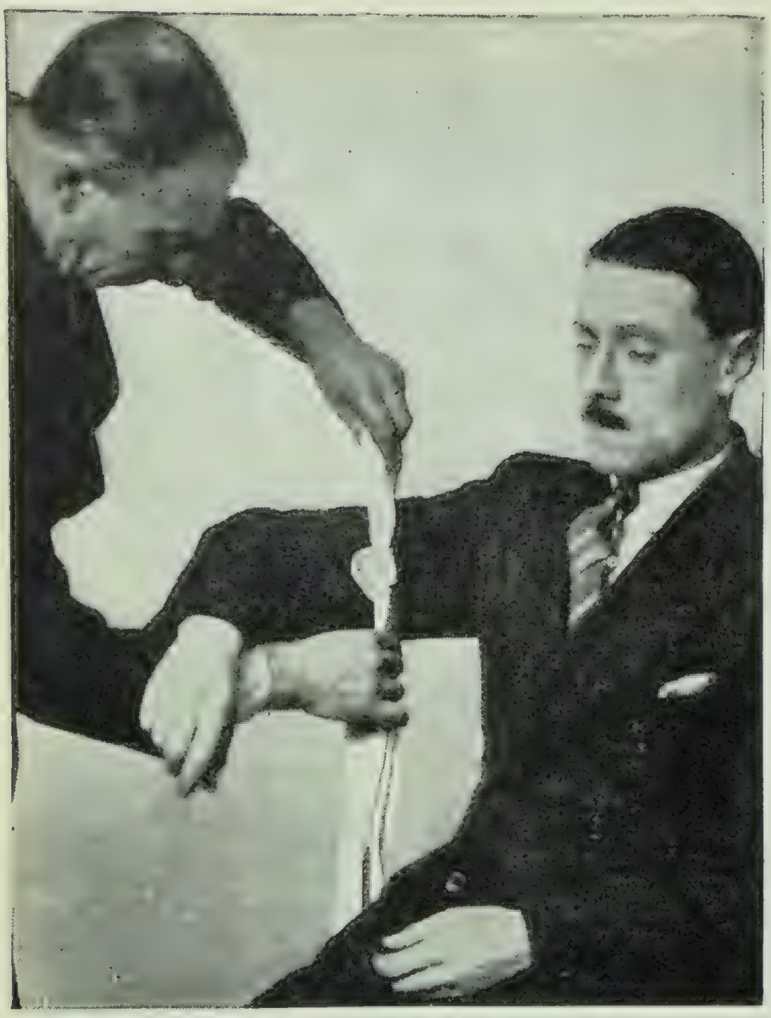
Now our bodies in this matter are very much like a motor-car engine, which takes some time after starting before it is " tuned up " to run smoothly and efficiently. When we get our " second wind," it simply means that all our organs have become " tuned up." When we suddenly increase the work our muscles have to do, it causes a change in the substances which make up the blood, and so it takes some time before the heart-pump and the breathing apparatus can adjust themselves and get into regular working order again.

YOU must have wondered sometimes when eating your breakfast or dinner how the food we eat and the oxygen we breathe reach the cells all over the body and how the useless matter is carried from the cells to be thrown away as waste. Just as our food is brought to us by ships from overseas, by railways and by motors, working night and day to make sure that we shall not starve, so the blood is travelling always through our arteries and veins, bringing food to the cells in every part of the body, from the top of our head to the tips of our toes.

To keep the blood " in circulation," as this constant journeying through the body is



A simplified diagram (from the back of the body), showing the path taken by the blood during its circuit. The impure, returning blood is shaded, and the pure blood left white.



This picture gives an idea of how to make a tourniquet to stop arterial bleeding. The first stage shows a stone rolled in a handkerchief being placed over the arm. In this way the blood vessels can be compressed.

called, we are given the most delicate and efficient engine the world has ever known—the pump which we call the heart. It is a bag of muscle divided into four chambers and it lies between the lungs in the chest, slightly towards the left side. Linked up with it are the tubes to carry the blood through the body, which we call the arteries and the veins, and there are openings joining the four chambers, guarded by *valves* which are specially designed to allow the blood to flow in one direction only.

When the muscle of the left side of the heart contracts, it drives the pure blood into the arteries, and when it relaxes, it sucks the pure blood into itself from the lungs. For when the blood has completed its journey through the body, it must be revived and given new life-giving properties. At precisely the same time, the right side of the heart is contracting, and is sending the blood to the lungs, where it is purified by the oxygen from the air we breathe, and when it relaxes it sucks the impure blood into itself from the veins.

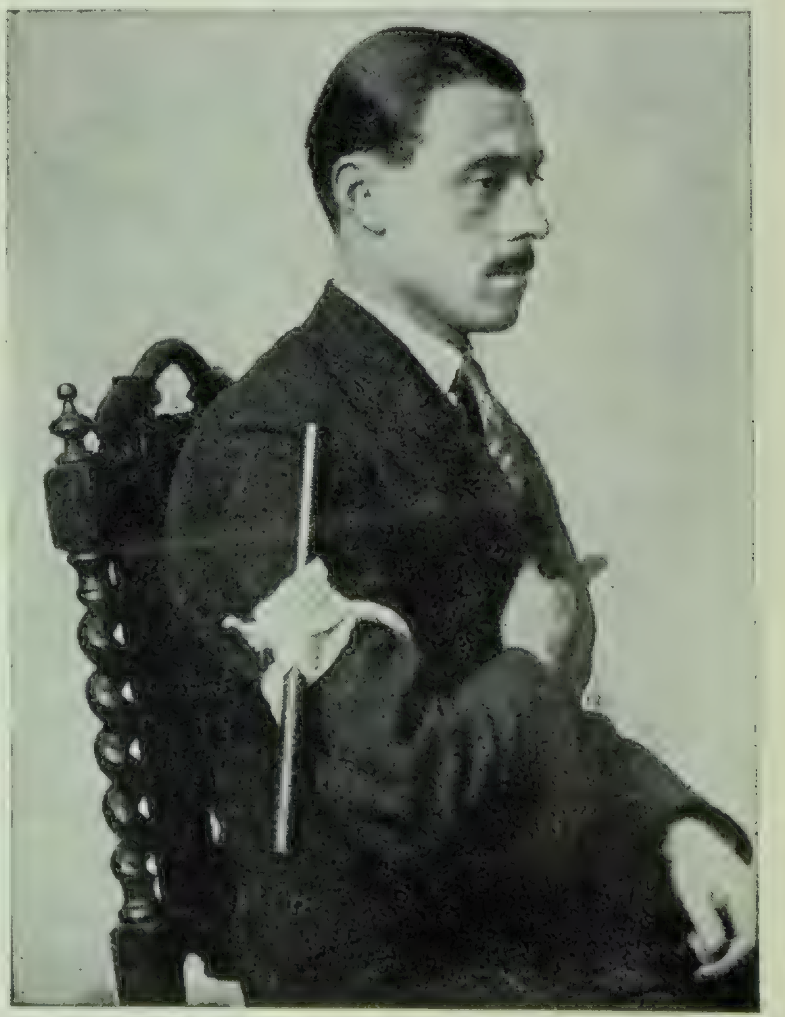
THE WONDERFUL, LIFE-GIVING JOURNEY OF THE BLOOD.

The heart-pump, when it is working healthily, acts (or " throbs " as we say) from seventy to eighty times a minute in its task of keeping the blood pulsing through the arteries at the correct speed. In a day it will do as much work as will take a full-grown man two hours to do, working at his hardest.

The pure blood, when it leaves the heart, travels first quite quickly through the larger arteries, then, as it reaches the smaller arteries it begins to slow down, until finally, when it reaches the smallest and finest of all, called the *capillaries*, it takes a full minute to travel one inch. The reason for this can be readily understood, for it is in these capillaries that the blood gives up the food and oxygen which it carries to the cells, and absorbs the waste in return to carry it out of the way. When it has done its work, the blood, which has become much darker in colour, speeds up and returns to the heart through the veins.

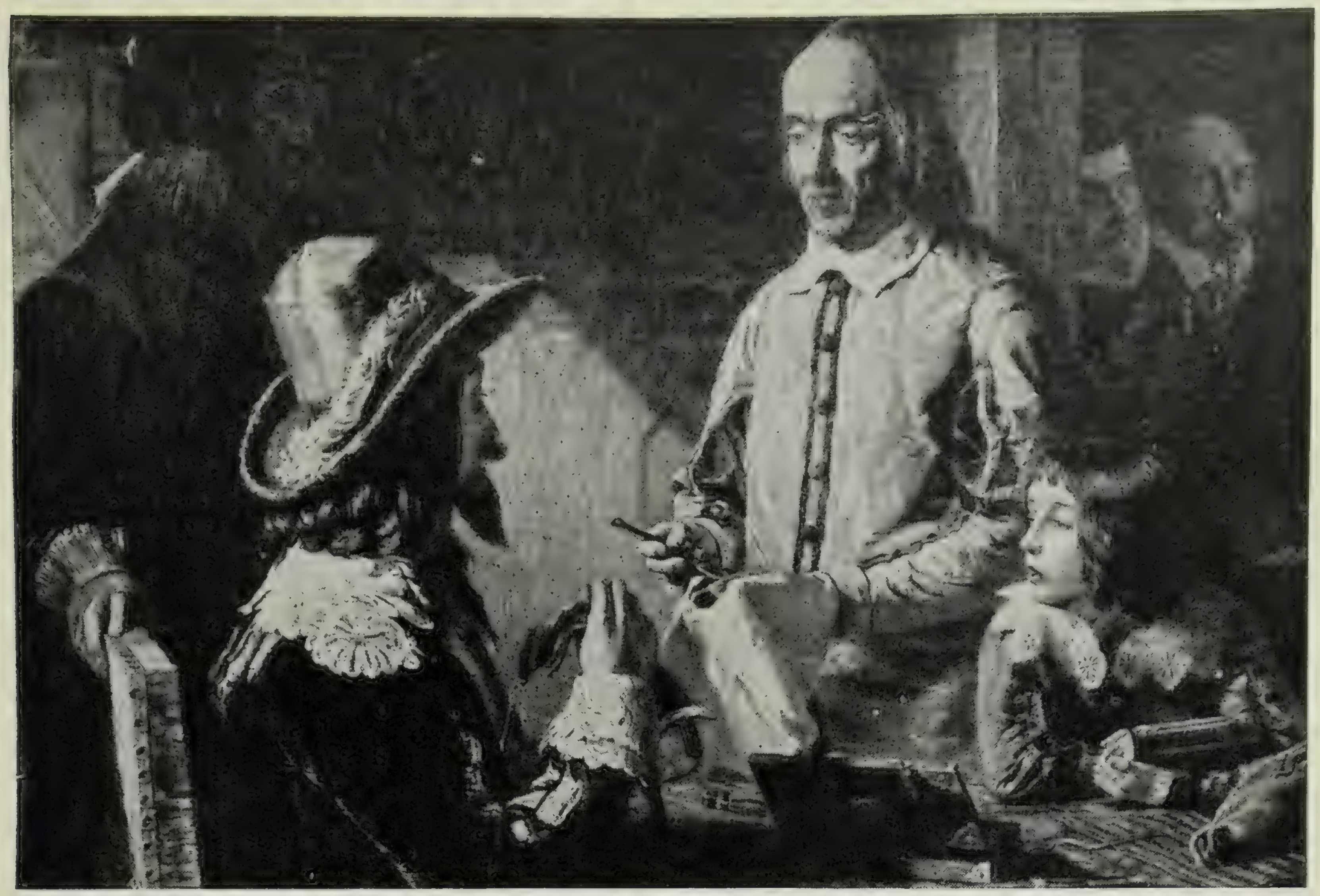
WHAT IS THE BEST WAY TO ARREST BLEEDING FROM A CUT ARTERY?

The heart-pump presses the blood very considerably in order to force it through the arteries and capillaries, and it is for this reason that when an artery is cut it must be tied up quickly, or a great deal of blood spurts out and is lost. Thus if an artery at the wrist is cut, for example, it is necessary to tie a handkerchief or bandage tightly round the upper

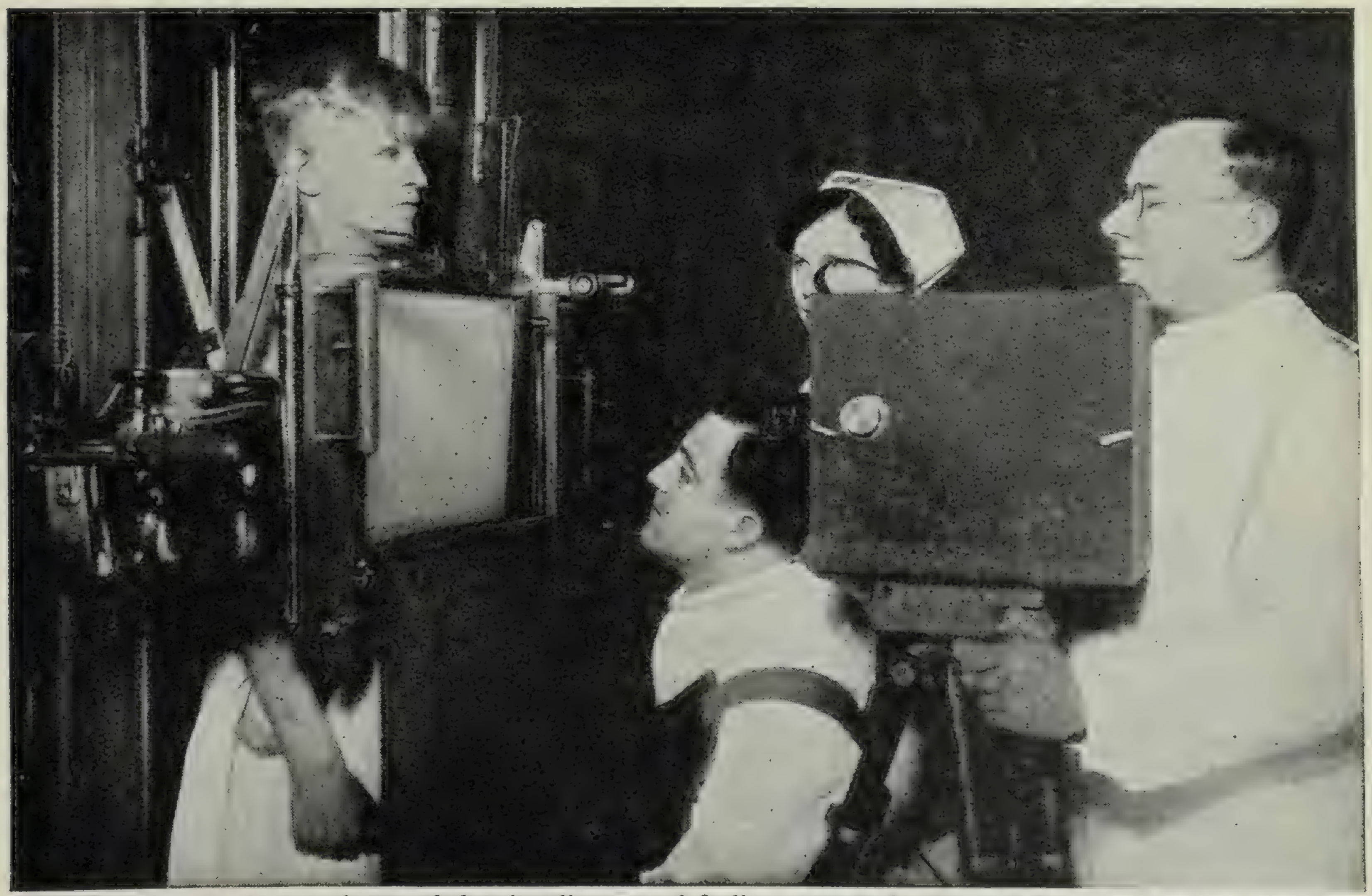


A ruler has now been inserted into the handkerchief and has been twisted round several times to increase the pressure of the stone on the artery and arrest the bleeding.

TWO MARVELS OF MEDICAL SCIENCE



It was an English physician, William Harvey, who first discovered, in 1628, that the blood makes a complete circuit through the body. This discovery was a landmark in the history of medicine. In the painting above, he is seen demonstrating the circulation of the blood to Charles I., who listens with wonder and admiration.



Patients to-day have every chance of cheating disease and finding a way to health now that so many new discoveries have been made in the medical world. An X-ray cinematograph machine has been invented in Germany, so that the doctor can study the organs of the body in motion. He is watching the filming of the heart's action.

The blood's scavengers at work. White blood corpuscles eat up and destroy germs, and in this way help to rid the body of disease.

arm, to prevent a serious loss of blood. We call the instrument which is often used for this purpose a *tourniquet*, and many lives have been saved by its prompt use.

When, on the other hand, we graze our finger or knee, we cut the capillaries only, and the blood, which is not moving so quickly or under such pressure, oozes out in a slow, steady flow.

WHY DOES A DOCTOR LISTEN AT OUR HEART, AND WHAT DOES HE HEAR ?

When we pay a visit to the doctor, very often the first thing he does is to listen to our heart. He does this with an instrument called a *stethoscope*, which consists of a little drum or bell-shaped piece of wood to which are attached two narrow rubber tubes with ends which will fit into the ears. It is simply an instrument which conveys sounds to the ears in a convenient way ; the doctor could hear the heart beating just as well by placing his ear close to the chest, but it is not always suitable to do this.

What does the doctor hear ? With every beat of the heart two sounds occur in quick succession followed by a pause. They are caused by the vibrations of the valves of the heart and the contractions of the muscles, and are very similar to the two syllables, lubb-dup, the first sound being dull and prolonged, the second shorter and sharper.

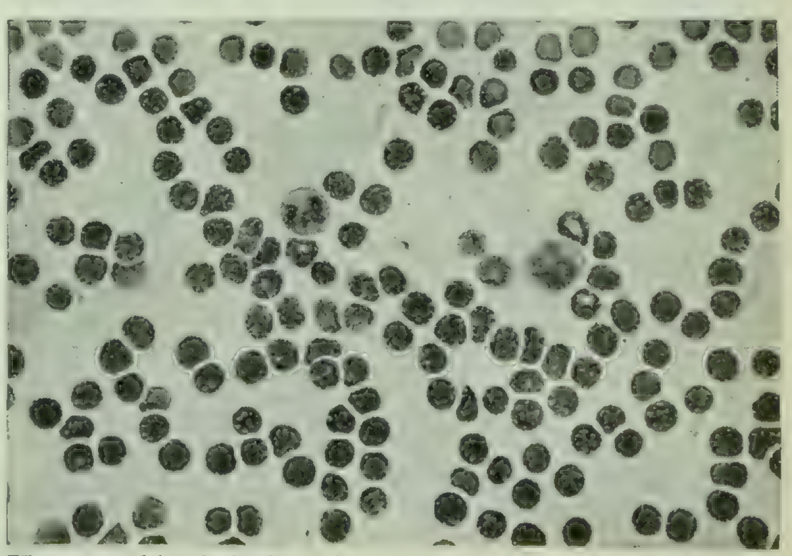
By judging these sounds, the doctor can tell how the heart is performing its duties. If they are weak and irregular, it means that the muscle of the heart is failing in its power ; if the sounds are not correct, but are rough, blowing noises instead, then the valves are not doing their work properly. The doctor learns much by listening to the heart and can very often tell just what to do to help it to perform its task more efficiently.

Another way by which the doctor can tell whether the heart and the arteries which carry the blood are working properly is by " feeling the pulse." If you place the tips of your fingers along the side of your wrist near the thumb you can feel quite plainly the beating of the artery which runs there. This artery is called the " pulse artery," and it is selected by the doctor for examination because it is conveniently near the surface of the skin and because it is supported by bone.

HOW THE BEAT OF THE PULSE SHOWS THE STATE OF THE HEART.

There are four points which the doctor always notes when he is feeling the pulse. First, the number of beats per minute, which he times by his watch and which tells him the rate at which the heart is beating ; second, the strength of the pulse-beat, for this shows the strength or weakness of the heart ; third, whether the pulse-beat is regular, for this tells him whether the heart is working smoothly ; and fourth, he can feel whether the artery itself is supple and strong, which tells him whether all the arteries are healthy and able to do their work.

When a person faints it is due to the heart ceasing to act for a moment or two ; the pulse misses a few beats and then is very feeble. During a fever, on the other hand, when the temperature of the body is high, the pulse beats very rapidly—sometimes as frequently as 120 or even 140 beats per minute. If the muscle of the heart is weak, the pulse may be very irregular. You will see, therefore, how much the doctor can learn from the simple operation of " feeling the invalid's pulse."



How our blood looks when under the microscope. Red and white corpuscles, floating in a transparent fluid, are seen in this photograph magnified 750 times.

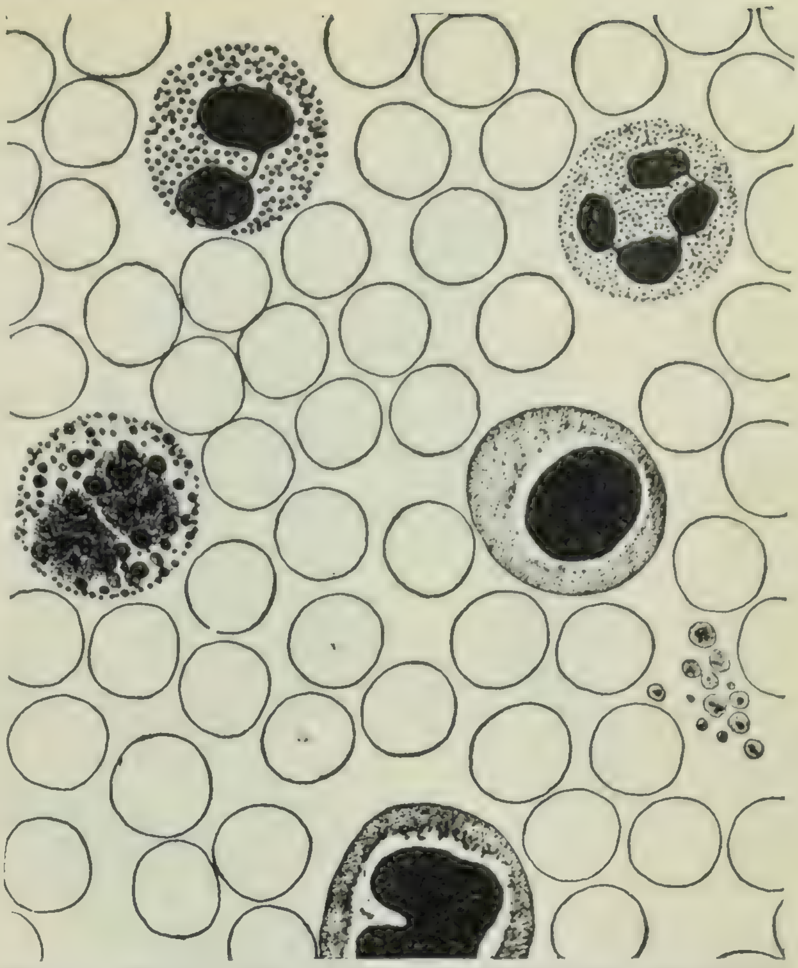
The blood, as we have seen, is the fluid which carries food to all the cells of the body and which removes also the waste material which cannot be made use of. In it live and move a vast army of willing workers, which the doctors call *corpuscles* and which are so tiny that they can be seen only under a powerful microscope. There are red corpuscles and white ones, and the red ones are so many that a portion of healthy blood no bigger than a lump of sugar contains 7,500,000,000 of them! Their red colour, which of course gives the red colour to the blood, comes from a pigment of iron which they carry, and it is these corpuscles which carry the oxygen from the air we breathe to bring life to the cells in every part of the body.

THE RED AND WHITE ARMIES WHICH MAKE UP OUR BLOOD.

The white corpuscles are not so numerous, but nevertheless, the same portion of healthy blood would contain from 6,000,000 to 12,000,000 of them! They are an army of fighters indeed, for their special work is to eat up and destroy the millions of germs which bring disease into our body. They destroy also the particles of useless and irritating matter which come crowding in from outside, and for this reason they are sometimes known as the "scavengers of the body."

We can now understand how useful it is that our bones are made hollow and can contain marrow, for it is in the red marrow that the red corpuscles are made, to keep up the large numbers which are required for our blood. The white corpuscles are made in busy groups of cells scattered all over the body and known as the *lymphatic glands*. If we are to be healthy these two factories in which our blood is made must supply us with sufficient to keep the total weight of blood as much as one-twentieth of the weight of the whole body.

When the body is weak after an illness, fresh blood is needed to help the muscles and nerves to do their work. Sometimes, when a person has been badly injured or has been very ill and has lost a great deal of blood, it is not possible for his body to manufacture a sufficient number of red and white corpuscles in time to save his life. For, if the quantity of blood flowing through the arteries and veins is not enough, the muscles and nerves cannot do their work properly and the whole intricate machinery begins to slow down. To prevent it stopping altogether, help must be given from outside, and the cleverest doctors in the world have tried for hundreds of years to find the best ways of doing this.



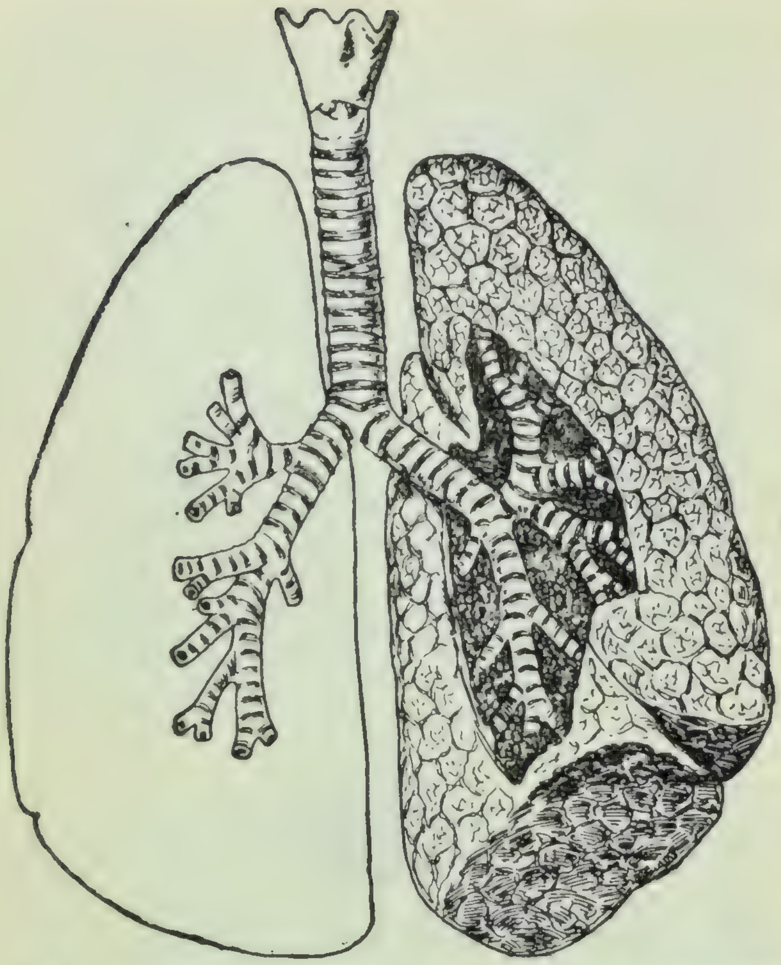
Normal Blood Cells. The circles represent red blood-corpuscles; the larger white corpuscles have been shaded.

HOW ONE MAN'S BLOOD CAN SAVE ANOTHER MAN'S LIFE.

Now, so skilful have doctors become in their work, blood can be taken from a healthy and robust person and transferred to the veins of the sick one. This operation, which is called *transfusion*, may seem a very simple one to perform, but many years' work was necessary before it was understood properly and could be done safely. For it was found that the blood of different people will not always mix. There are really four different types of blood, and to transfuse the wrong type is very dangerous. Fortunately, there is one type which is called "universal," for it can be safely used in all cases of transfusion, but it is necessary to test the blood both of the person who is giving and the person who is receiving before the operation can be performed.

The blood may be made to flow directly by means of a tube connected by hollow needles, from a vein in the healthy man's arm to one in the arm of the injured man. Many hospitals nowadays keep a list of healthy people who are willing to give their blood in cases of emergency, and transfusion has saved the life of many persons who were very seriously ill.

Whenever we cut or graze our fingers and blood begins to flow, we notice that very



How the breathing apparatus works. This picture shows a diagram of a normal lung, with the bronchial tubes and the spongy substance composed of tiny air-cells.

quickly it becomes sticky and solid-looking. When it does this it is said to *clot*, and, as with everything that happens in the body, there is a very good reason for the process. For the clot of blood which forms over the cut quickly stops further blood from flowing out, and bleeding stops before the loss of blood becomes dangerous. Clotting is nature's protection against excessive loss of our body's most precious fluid.

OXYGEN HELPS TO PURIFY THE BLOOD, AND IS ONE OF OUR GREATEST FRIENDS.

To form a clot, certain substances which are dissolved in the blood form a solid meshwork, which entangles the blood corpuscles and produces a sticky, jelly-like mass. It is rather like what happens when the white of an egg becomes solid as it is boiled.

We have seen how the great army of red corpuscles in the blood works ceaselessly day and night to carry the oxygen which brings life to the cells everywhere in the body. Now let us look at another wonderful part of the machine, the delicate, tireless air-pump which brings oxygen from the air outside into close contact with the red corpuscles as they are sent by the heart to be purified.

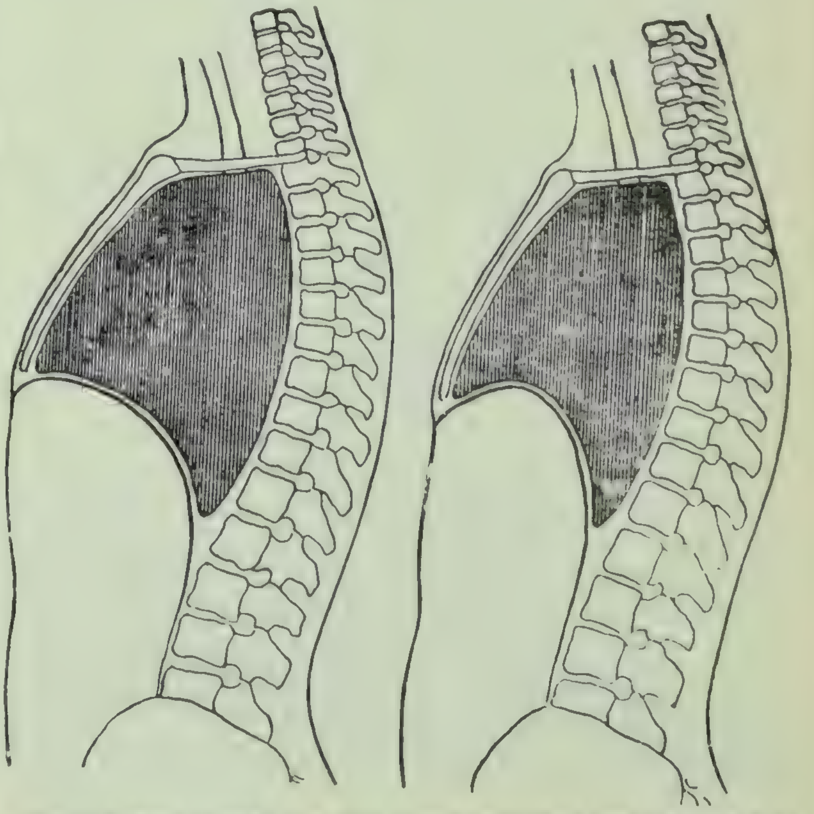
Oxygen is the very active gas which is a part of the air around us, and especially of the fresh air which we breathe at the seaside or in the country. If the cells in our body are to do their work properly it is essential that they should have a plentiful supply of this life-giving gas.

HOW AIR IS CLEVERLY PUMPED IN AND OUT OF OUR LUNGS.

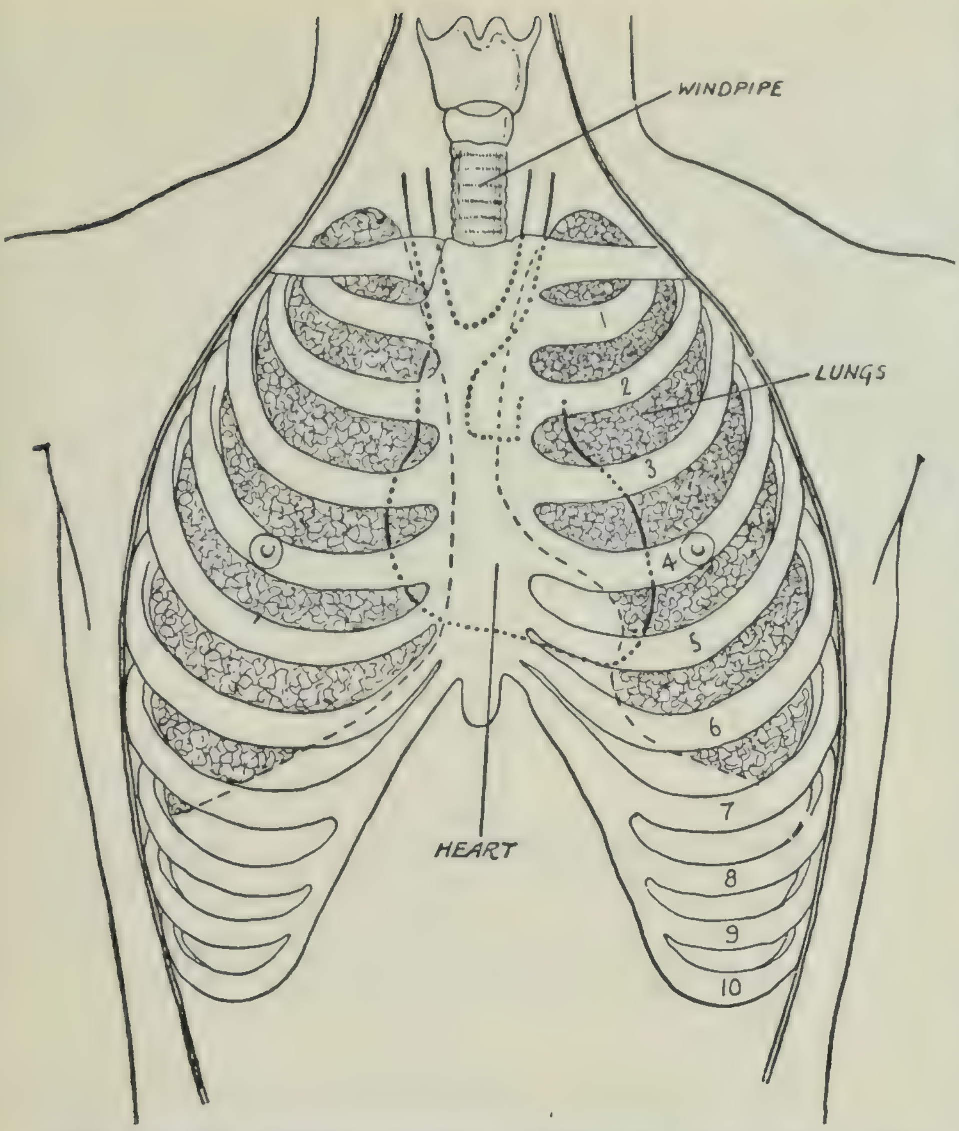
Each time we breathe we draw a quantity of air into our lungs. It enters through the nose and passes down the windpipe and into the lungs through a number of smaller tubes called the *bronchi*. The lungs are made of a soft substance rather like a honeycomb, which is really a very large number of tiny air-cells, each joined to the next one by tiny tubes. The dark, impure blood from the veins flows round these air-cells, separated from the air itself by a thin membrane only, through which the oxygen can pass quite easily. The gas joins the red corpuscles, makes them bright red and vigorous again, and they pass on to the heart-pump to begin their journey once more.

At the same time, the corpuscles give up through the thin membrane some of the waste matter they have brought back from the cells, in the form of the inactive gas carbon dioxide, and this is breathed out with the other inactive parts of the air which have remained in the air-cells of the lungs.

The machinery which pumps the air in and out of our lungs is very cleverly and carefully made. The central control station at the brain first sends a message of instruction to the



The diagram shows how the chest subsides and expands as we breathe—breathing in (*left*), and breathing out (*right*).



The lungs lie behind the ribs on either side of the heart, and are surrounded by a smooth membrane called the pleura.

proper muscles, and a large flat muscle, called the *diaphragm* and fixed at the bottom of the hollow contained by the ribs, moves downwards. The muscles attached to the ribs contract and the ribs move outwards, so that the hollow inside is increased in size, and air is sucked into the lungs to fill up the empty space. Then the muscles relax again, the hollow inside becomes smaller, and the impure air containing carbon dioxide is pressed out through the windpipe and nose.

HOW MANY TIMES DO YOU BREATHE IN AND OUT EVERY MINUTE?

A healthy person breathes in and out from fifteen to twenty times every minute, and as long as life lasts the process goes on without ceasing. Whether we are awake or asleep, messages are flashing backwards and forwards to the brain and the muscles are working steadily to draw the life-giving oxygen into the lungs.

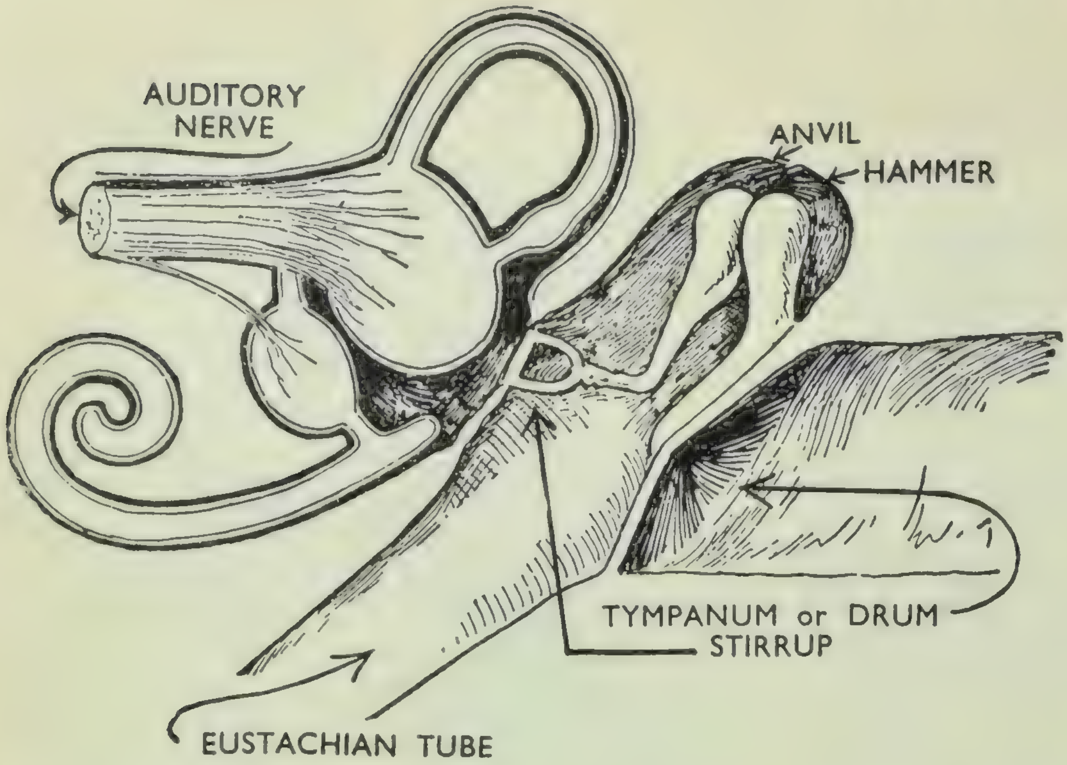
Whenever we run hard or play some vigorous game, all the parts of our body must work harder, and the blood therefore must carry much more oxygen to the cells. We begin to breathe rapidly so that the blood shall have extra supplies of oxygen, until after a specially long or hard run we find suddenly that although we are panting hard we cannot breathe fast enough, and we have to rest awhile to "get our breath"—really to let the blood catch up in its work of distributing oxygen.

WHY DOES OUR BREATHING BECOME RAPID AFTER STRENUOUS EXERTION?

There is another reason too why we pant after strenuous exercise. Our bodies become very warm and the air in our lungs carries some of this warmth with it when it is breathed out, thus helping to cool us down. No doubt you have watched a dog panting on a hot day, even when it is lying down. It is busy keeping cool by letting the air it breathes out take some of the heat away from its lungs.

Sometimes when we are ill, also, we begin to breathe more rapidly. If, for instance, we are feverish and our temperature is high, it is especially helpful to cool ourselves by breathing more rapidly, and we find sometimes also that the fever has affected the control station in the brain, so that it flashes its messages more quickly to the muscles, making us breathe rapidly again. When disease germs attack the lung itself, as in pneumonia, the sufferer breathes more rapidly, because much of the

Workers in a London store taking breathing exercises on the roof during the lunch hour. [*Fox Photos*



The passage from the outer ear is closed by the ear-drum. The hammer, anvil, and stirrup bones, seen above, convey sound vibrations from the drum to the inner ear.

lung is out of action, so that the healthy portion has to work harder to keep up the proper supply of oxygen to the blood.

Only a small proportion of air we breathe in passes into the blood. It is not difficult to measure the amount of air we breathe in and the amount we breathe out and to find out how much of this is oxygen and how much is carbon dioxide. When a grown-up man is not working specially hard only an amount of oxygen such as could be held in a small tumbler is taken up by the blood with each breath. It is as well to remember also that our lungs, even when we breathe out fully, are never completely empty of air. They always contain as much air as would go in eight and a half tumblers, and when we are quietly resting, we only breathe in about two tumblers-ful with each expansion of the chest.

HOW A DOCTOR DISCOVERS DISEASE BY "LISTENING-IN" WITH HIS STETHOSCOPE.

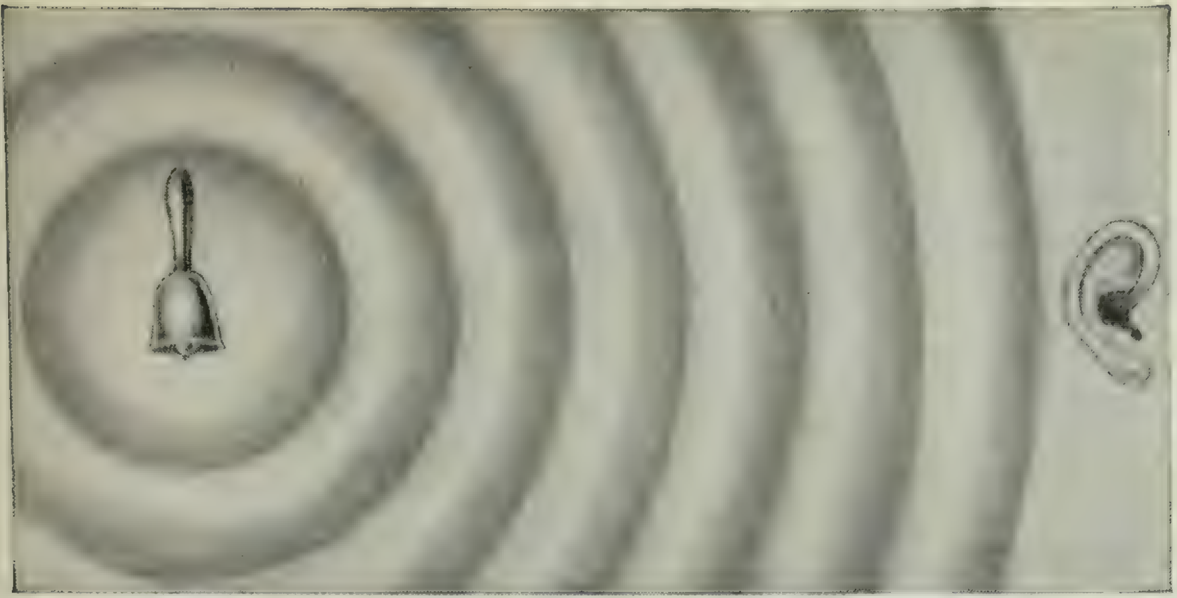
The rushing-in-and-out of air into our lungs produces sounds—breath sounds as they are called—which can be heard by the doctor when he places his stethoscope to our chest. The doctor knows the kind of sound healthy breathing should make, and so he can tell quickly if a part of the lung is diseased or not working properly, for the sounds become different immediately. From the new sounds he hears he can often tell how much of the lung has been attacked by the disease and what kind of disease it is. "Listening-in" to the lungs is a most valuable help to the doctor in deciding what shall be done to enable weak lungs to grow strong again.

The sneeze which comes on so suddenly when we have a cold in the head, or when we sniff a powder such as pepper or snuff, has a special purpose just as all the other happenings in the body. It is Nature's way of ridding the delicate membrane which forms the inside lining of the nose of any harmful material which may have found its way there. The cold in the head irritates this membrane just as the pepper does, and to dislodge the irritating particles Nature arranges for us to breathe out suddenly and explosively through the nose.

WHAT MAKES US COUGH WHEN WE HAVE A BAD COLD?

In the same way irritating particles sometimes collect in the air-tubes and in the lungs, especially as a result of a cold, which causes matter containing harmful germs to collect there. When this irritation is felt, a message is sent to the control station in the brain, which arranges at once for us to breathe out explosively through our mouths—in other words, for us to cough. Sometimes the irritation is there because of disease germs in the lining of the air-tubes, and when this happens, as in bronchitis, the cough cannot dislodge

The organ of hearing inside the ear is shaped like a snail's shell, and has semi-circular canals which are concerned with balance.



What is sound and how does it reach us? The diagram shows " waves " of alternate condensation and rarefaction in the air, producing the sensation of sound

the irritating matter and we experience what is known as dry-coughing.

The outside air nearly always contains particles of dust and also quite frequently germs which will cause disease once they get into the body. To prevent these particles and germs reaching the lungs, where they would be harmful, Nature has provided the body with a specially designed filter—which we call the nose.

HOW WE ARE PROVIDED WITH A NOSE-FILTER TO KEEP BACK DUST AND GERMS.

Inside the nose is a thick meshwork of hair whose special work is to entangle dust and germs and prevent them going farther when we breathe air into the lungs. We can understand, therefore, why the doctor always advises us to breathe through the nose, for if we breathe through the mouth there is no filter in the way, and all harmful matter can easily reach the lungs, where it obstructs the proper working and lessens the supply of life-giving oxygen to the blood. The nose-filter also warms the cold, winter air as it passes through, thus preventing a sudden chill reaching the delicate membranes of the lungs and air-tubes.

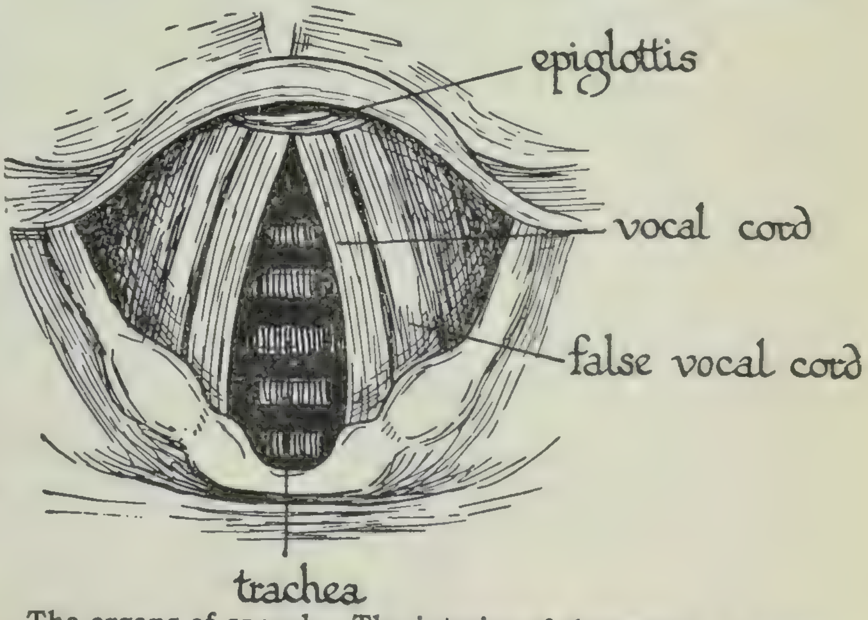
As you have probably read elsewhere in this book, the sounds we hear come to us as vibrations in the air around us, one vibration following another in rapid succession in much the same way as the waves of the sea chase each other all day long on to the beach. When a violin string is played on with the bow, the string is set vibrating rapidly to and fro, and with each vibration it sends off a " wave " in the air, until soon the air around our ears is pulsing busily as wave after wave passes through it.

Now when we speak or sing something very similar happens. Inside the Adam's apple—which is the hard lump you can feel in your throat—is the wonderful stringed instrument which we call the *voice box.* It consists of two very thin and delicately-made elastic membranes or skins, opposite each other, looking rather like stretched strings and known as the vocal cords. These are placed at the top of the windpipe, so that the air we breathe in or out must pass by them. When we are not speaking or using our voice, the cords are widely separated to allow air to pass freely to and from the lungs, but as soon as the brain sends a message that we want to speak, the muscles draw the cords together and the air passing to and fro sets them vibrating.

This produces waves in the air just as do the vibrations of a violin string, and when these waves reach the outside air we hear them as sounds. If the muscles stretch the cords tightly, the sounds are highly pitched ; when the cords are slack the sounds are low in pitch. They may be loud or soft according to the force with which the cords are vibrating, and it is interesting to remember that the spaces in the mouth, nose and throat also have an effect on the tone and loudness of the sounds in very much the same way as the loud-speaker affects the sounds coming from a wireless set.

WHY ARE OUR EARS MADE IN SUCH A CURIOUS SHAPE?

No less wonderful than the voice box with which we *make* sounds is the instrument with which we *hear* them. You have probably



The organs of speech. The interior of the larynx or voice-box, showing the vocal cords and the epiglottis—a trap-door, closed by the action of swallowing, which prevents food and drink from entering the wrong channel.

wondered many times why our ears are made in such a curious shape. Everything in our body, as we have seen already, is put there for a special purpose and with a special task to do, and you will not be surprised therefore to hear that our ears are made in the shape we can see so that they shall best be able to catch the waves of sound which are passing swiftly to and fro in the surrounding air. When the waves are caught, they pass along the passage inside the ear until they fall upon a thin membrane stretched in their path, and known to us as the ear drum. As the waves strike this drum they set it vibrating and messages are sent rapidly to the brain, which recognises them as the sounds we hear all day long. When you think of the number of different sounds you hear in a day, you will realise how wonderful is the instrument which can tell just how each one is different from the rest and remind you each time exactly what each different sound means.

HOW THE FOOD WE EAT AFFECTS OUR HEALTH

WHEN dinner is ready and we sit down contentedly to eat it, we rarely think why we enjoy it so much. We are hungry, and that is enough. Yet each mouthful is just beginning a most wonderful journey; many things must happen to it before it can take its place in the delicate machinery of our body. Even in our mouths the searching test begins, for the teeth as we chew break up the hard lumps, rejecting anything, such as pieces of bone, which would be too hard for the laboratory farther on to deal with. In the mouth also it is mixed thoroughly with saliva, which begins the long process of breaking it up into simple forms that the body can use easily.

Then when preparation is complete, a message flashes to the central control station, and immediately instructions are given to the muscles that the mouthful is to be swallowed, and the food passes quickly to the next stage of its journey. Through the long tube which we call the *gullet*, it passes to the expanded bag-like organ called the stomach. Here it remains for a while, moving gently to and fro, until it is thoroughly mixed with powerful juices which attack it through tiny passages in the stomach-wall. Already the chemicals in the saliva have turned the starchy parts of the food into sugary substances which will flow easily and dissolve; now acids from this wonderful laboratory attack the heavy, body-building parts, called *proteins*, and turn them into simpler substances.

Then, when the stomach has completed its work, there begins a long, slow journey through coil after coil of a soft, flexible tube, narrow at first but widening towards the end, and known as the small and large *intestine*.

During this stage of its journey the food travels more than *twenty-five feet*, or nearly half the length of a cricket pitch. During this stage the good work begun by the saliva and the juices in the stomach is completed. As the food leaves the stomach a call is sent by the body's wonderful telegraph system for new and powerful help, and juices pour in through tiny tubes to mix thoroughly with the food. The pancreas, which is placed just below the stomach, prepares and despatches its share, and the liver works steadily to make the fluid called *bile*, whose special purpose is to attack the fatty parts of our food

A much-travelled fruit begins its last journey. Plenty of fresh fruit should be included in our diet if we want to gain perfect health.

and split them up into substances which can be carried easily by the blood.

Now we come to the real secret of this long canal. Like all the other parts of the body it is cleverly constructed in the best possible way to do its special work. Along its whole length innumerable finger-like projections from the wall of the tube stretch into and mingle with the food which flows past them. These projections are interwoven with a wonderful network of tiny capillaries, which we know are the tiniest of all the tubes which carry the blood. When the chemical laboratory has done its work, therefore, the food moves slowly past the flowing blood, separated from it only by the thinnest of membranes, for a long time and over a very large surface. The useful parts of the food pass gradually through the membrane and are carried away by the blood to feed the hungry cells which are waiting all over the body for new strength to carry on their work.

A clever scientist, Dr. B. G. Hauser, has designed a working model of the internal organs, so that he can demonstrate the process of digestion as it works in the human body.

HOW FOOD IS STORED IN DIFFERENT PARTS OF THE BODY.

Clearly, this intricate process cannot happen very quickly; in fact, after the stomach has been busy for as long as *three to four hours* in its work of preparation, it is still another two hours before the blood has carried new strength to the cells. After this long time, too, when the food has been sifted and examined so carefully, there are still parts of it left which are not suitable for use. It would not do to leave this waste matter too long in the intestine, for in time it would putrefy and poisons would be formed which would pass into the blood and hold up the working of the whole body. The muscles which make up the lining of the small intestine accordingly push the waste matter slowly along and into the large intestine, from which it is finally passed out of the body. You will see at once how the poisons, once they are formed, will act upon the body like grit in the wheels of a machine, and how important it is, therefore, that the waste matter should be removed quickly and regularly—so important indeed is this that doctors nowadays make it one of the first rules for keeping us in good health.

What happens, then, when the food completes its long journey and reaches the waiting cells? It is not possible or desirable that all of it should be used immediately, for then we should have no reserve left for emergencies, and often, when we run hard or exert ourselves more than usual playing cricket or football, more food is required to give us strength than can be obtained from the busy laboratory. Hence all the cells in our body very wisely store some of the food which is sent them. The liver and the muscles store the sugary and starchy parts of the food, to be used up when necessary to give strength to the muscles; fat is stored in connecting tissues in many parts of the body, helping to form a warm coat to protect the body against sudden chill, and forming the chief source of the heat which comes from the body itself. There is no special place for the storage of *protein*; it is found in every cell of the body.

THE FIRE WITHOUT FLAME WHICH GIVES US WARMTH AND ENERGY.

When the time comes for the food to be used, a call is sent to the oxygen which is being carried from the lungs by the blood. If you have ever experimented with oxygen during the chemistry lesson at school, you will remember how much more fiercely a lighted taper burns when it is plunged into a jar of the gas, and how when the taper finally goes out the jar no longer contains oxygen, but carbon dioxide. Almost exactly the same thing happens in the cells, *but without any flame at all.* The food joins with the oxygen and is burnt up, heat is released to warm our bodies, and energy to give our muscles strength and to keep all the parts of the body working steadily night and day. The carbon dioxide is carried off by the blood, and, as we know already, is breathed out with the inactive air from our lungs. Truly a remarkable process!

HOW LONG IS IT POSSIBLE TO EXIST WITHOUT FOOD OR DRINK?

Very few of us know what it means to go without food for a long period. We may occasionally miss a single meal, and this will do us no harm—indeed, if we have been eating too much, it will do us good. Frequently we find that when dinner is ready we are not really hungry, and that is the body's way of telling us that it does not require any more food for the moment, or that it is so out of order that the laboratory inside us cannot do its work properly. If we miss many meals, then our health will suffer. We shall lose our covering of warm fat and become so weak that the tiny enemies which constantly attack us from outside cannot be resisted any longer.

Lack of nourishment drains our strength and makes our bodies thin and weak. The picture shows an Indian fakir, who is a professional faster, with his alms bowl and attendant. [*E.N.A.*

WHY THE THOUGHT OF A GOOD MEAL MAKES OUR MOUTHS "WATER."

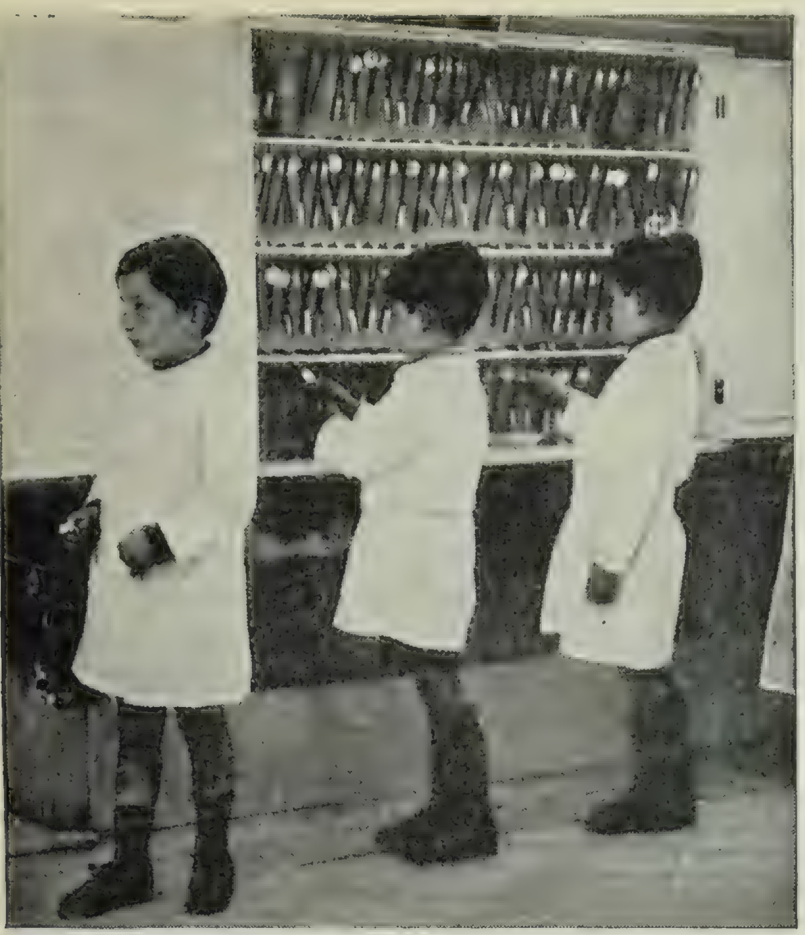
How long could we exist without any food at all? This depends on whether we are allowed to drink water or not. Without water we should not live more than a week. If water is there to drink, however, it is possible to live for quite a long time, provided, of course, we are healthy to begin with. Every country contains people who make a practice of going without food for long periods—in some cases for as long as forty days! Not every one, of course, could live so long, but it is yet one more wonderful thing about our body that it is always ready for an emergency and surprises us often by its endurance of hardship without food to bring it new strength.

We have all felt our mouths "water" at the sight of a dainty dish or an attractive sweetmeat. We have all "smacked our lips" at the clatter of tea cups or the smell of a savoury meal which greets us as we come in hungry from a hard game—but do we all realise how complicated is the process which brings this about? We see the attractive food, or smell it, or even merely think about it; a message flies to the central control station that soon we shall be eating; immediately the telegraph system in our body is carrying swift instructions to the glands which prepare the saliva, and finally the saliva itself pours into our mouths to be ready to do its work in splitting up and preparing the food.

WHY MEALS SHOULD BE DAINTY AND APPETISING.

If the food is *not* pleasing to our eye or to the sense of smell, in other words, if it is not appetising, then the saliva will not flow so readily, and the food will not be properly prepared for its journey through the body. That is the reason why our food should always be daintily cooked and nicely served. A good appetite and a good digestion go together.

We can understand too that if the saliva is to do its work properly it must be very thoroughly mixed with the food. Now, it is the purpose of our teeth to reduce our food to small particles to enable the saliva to do its



Clean your teeth regularly after meals. Here are children in school taking their tooth brushes from the dental cupboard for the cleaning parade. [*British Continental*

work, and we must, therefore, make our teeth do *their* work properly—in other words, doctors tell us to chew our food very thoroughly to make sure that the laboratory will not be overworked in the next stages of the journey.

WHY DO WE LOSE OUR TASTE WHEN WE HAVE A BAD COLD?

We have all noticed how very often the fact that we have a cold in the head makes even the most appetising dainty seem flat and tasteless. The reason is curious and unexpected, for it depends not upon our mouth at all, but upon our *nose.* In this organ of scent is the membrane that controls our sense of taste. When we develop a cold, the sensitive membrane which lines our nose becomes swollen and inflamed, and as it is this membrane which can distinguish one smell from another, our sense of smell is largely put out of action. Now here is the curious thing; we distinguish the flavour of our food not by its *taste,* but by its *smell!*

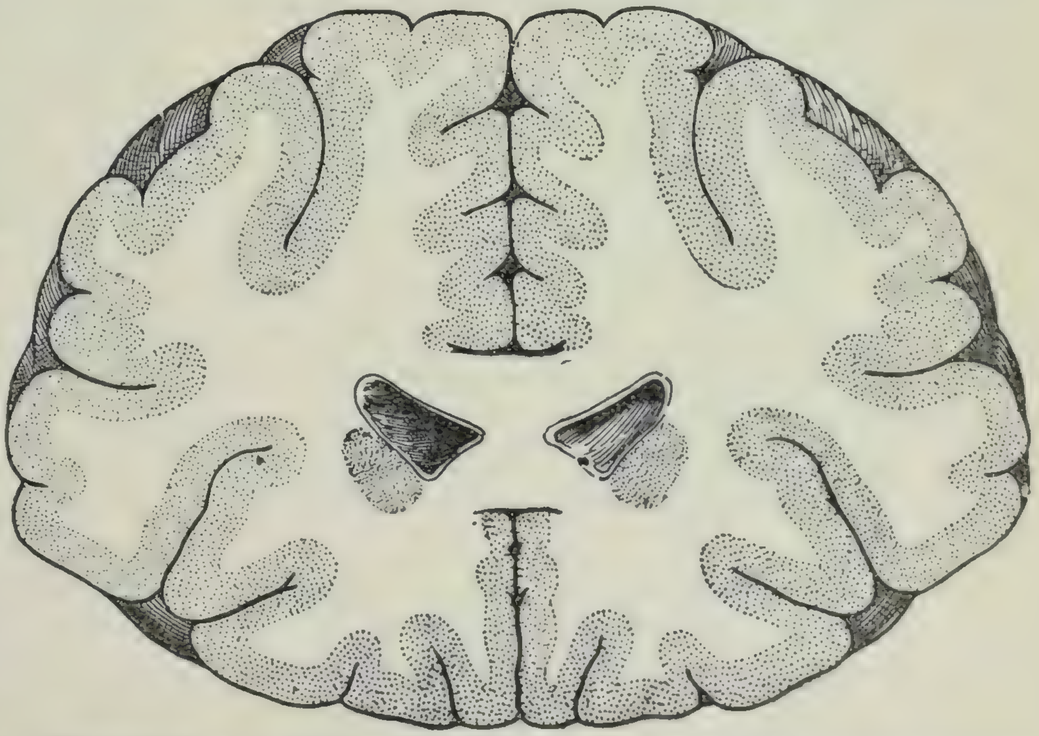
HOW MANY "TASTES" ARE THERE AND WHAT ARE THEY?

There are only *four* tastes, sweet, sour, salt and bitter, so that for all the delicate shades of flavour which make up the attractiveness of the food we eat, we are dependent upon the sensitive membrane of the nose. If this is not working properly, then our food loses its taste, and we cease to enjoy our meals.

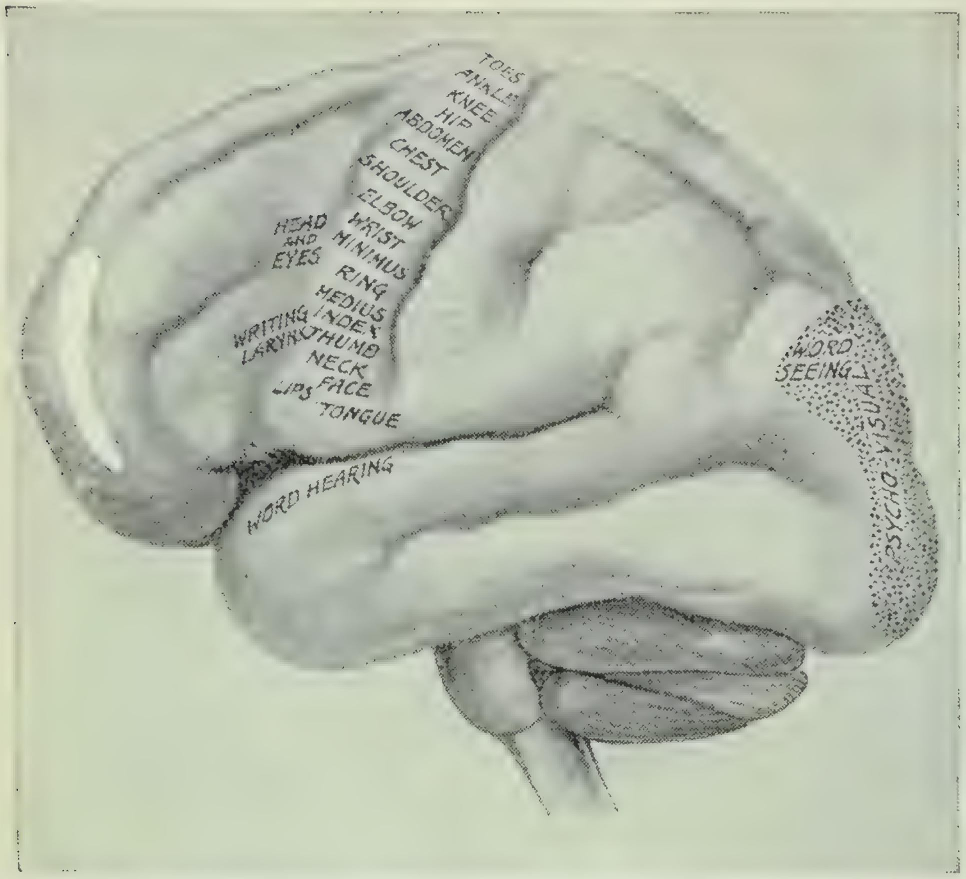
THE TELEGRAPH SYSTEM WITHIN US

INSIDE the flat bones of the skull is the most complicated and important organ in the whole body—the brain. It is gray in colour, and its surface has a peculiar folded appearance, rather like the outer shell of a walnut. The folds, of course, have their special purpose, for they enable a very large amount of the precious substance of the brain, called the *gray matter,* to be packed away within the small space inside the skull. It is interesting to remember that it is in this way that man has developed his large and clever brain, for the surface of the small, dull brains of the animals is quite smooth.

The gray matter consists of millions and millions of tiny nerve cells, each cell possessing a fine fibre which links it up with another cell or which passes to some distant part of the body. The cells are arranged ingeniously in groups within the gray matter, and each group is given the control of some special work in the body. Thus some cells control our muscles, others enable us to see and to hear, and yet others manage our breathing, our food-laboratory, and the action of the tireless heart-pump.



The thinking machine. The function of the mind is performed by the "gray matter" of the brain—a layer of delicate nerve cells arranged around the outer surface, as shown in the diagram.



The headquarters of the nervous system, where messages are sent to different parts of the body. This is really the "control room." The parts of the brain controlling various limbs and organs are marked.

The brain cells are linked up with every organ and every tissue of our body by a fascinating telegraph system, in which the wires which carry the messages are what we know as *nerves*. These are thread-like structures of many different sizes, some even being quite large and containing a great number of fine fibres. Each nerve has its special work to do ; some types carry messages to the brain and others messages *from* the brain to the cells. The brain itself is the central telegraph exchange where the messages are examined and where answers are prepared and sent off.

HOW A MESSAGE IS FLASHED TO THE BRAIN, WHICH ACTS AS A TELEGRAPH EXCHANGE.

Suppose, for instance, some day when you are walking along the street, a tiny child suddenly trips on the pavement in front of you and falls. You see this happen, which means that a message flashes along the nerve which runs from your eye to the brain. Immediately the exchange sends out instructions along other nerves to your muscles, and you run forward, stoop down, and help to pick up the child.

You will soon understand, if you consider for a moment, how constantly this wonderful telegraph exchange is at work when we are awake. It deals with millions of messages every day, each message being sorted out, sent on to the proper part of the exchange and replied to appropriately. Only during sleep does the exchange close down, and then only in part, for there are many working organs, such as the heart-pump and the lungs, which never cease, night or day.

THE TELEGRAPH THAT LINKS EVERY PART OF OUR BODY.

When an impulse or message travels along a nerve, an electrical alteration takes place within the nerve, and this makes it possible by a simple experiment to measure the speed at which a nerve message travels. Strangely enough this speed is found to vary with the temperature of the body ; thus in cold-blooded animals it is slower than in warm-blooded ones. In the octopus, or devil-fish, for instance, where the nerves are not insulated as they are in more highly developed animals, a nerve message travels only two yards in a second ; in the frog, it travels about thirty yards per second, while in man it travels at the exceedingly high speed of 130 yards per second, or nearly 270 miles per hour. It is most important, of course, that the human telegraph system should work very quickly indeed, for you will readily understand that when, for instance, you are playing cricket, the messages from the eye to the brain and from the brain to the muscles must travel with lightning speed, if your bat is to hit the swiftly travelling ball as it reaches you.

What happens, then, when a nerve is cut or so damaged that it cannot do its work properly ? Just as when a telegraph wire is broken, no messages can travel backwards or forwards along the nerve. Thus if the nerve is going to a muscle, then that muscle is put out of action, or as we say, *paralysed*, because none of our muscles can act without instructions first from the brain.

MUSCLES WITHER AND DIE WHEN CUT OFF FROM COMMUNICATION WITH THE BRAIN,

There is a danger when this happens that the portion of the nerve which is cut off will wither up and die, but it is possible for new growth to occur, although it will take a long time, and eventually the new nerve will take its full part in carrying the urgent messages to and fro. It is interesting to note that any muscle which is cut off from all communication with the central control soon wastes and will disappear almost entirely if the nerve-telegraph is not restored.

WHAT CAUSES THE FEELING OF "PINS AND NEEDLES" IN OUR LIMBS?

Every one laughs when we get "pins and needles," whether it be in our arm because we have knocked our "funny bone," or in our feet and legs because we have been sitting uncomfortably on a hard chair for some time. But *we* know that "pins and needles" can often be quite painful. Actually we have injured one of the important nerves, which becomes violently stimulated and sends unexpected painful messages down to the tips of our fingers or down the legs into our feet. In the case of the "funny bone" we can actually feel the nerve which is hurt, under the skin as it passes round the elbow, and each tiny prick we feel is a message which the injured part has suddenly sent out.

Another very important and complicated part of the work of the human telegraph system lies in maintaining our balance. It seems very easy, as we grow up, to keep our balance when we are walking, but watch a young baby trying to walk. It would seem to be a most difficult affair—as indeed it is to the baby. The part of the nerve system which controls our balance is intricate and delicate, and is easily put out of gear. Its central exchange is situated in a hinder part of the brain called the *cerebellum,* and it is linked up by nerve-telegraphs with the skin, the muscles, the eyes and a special organ inside the ear. Any injury or disease affecting this part of a person's brain will make him reel and stagger as he walks.

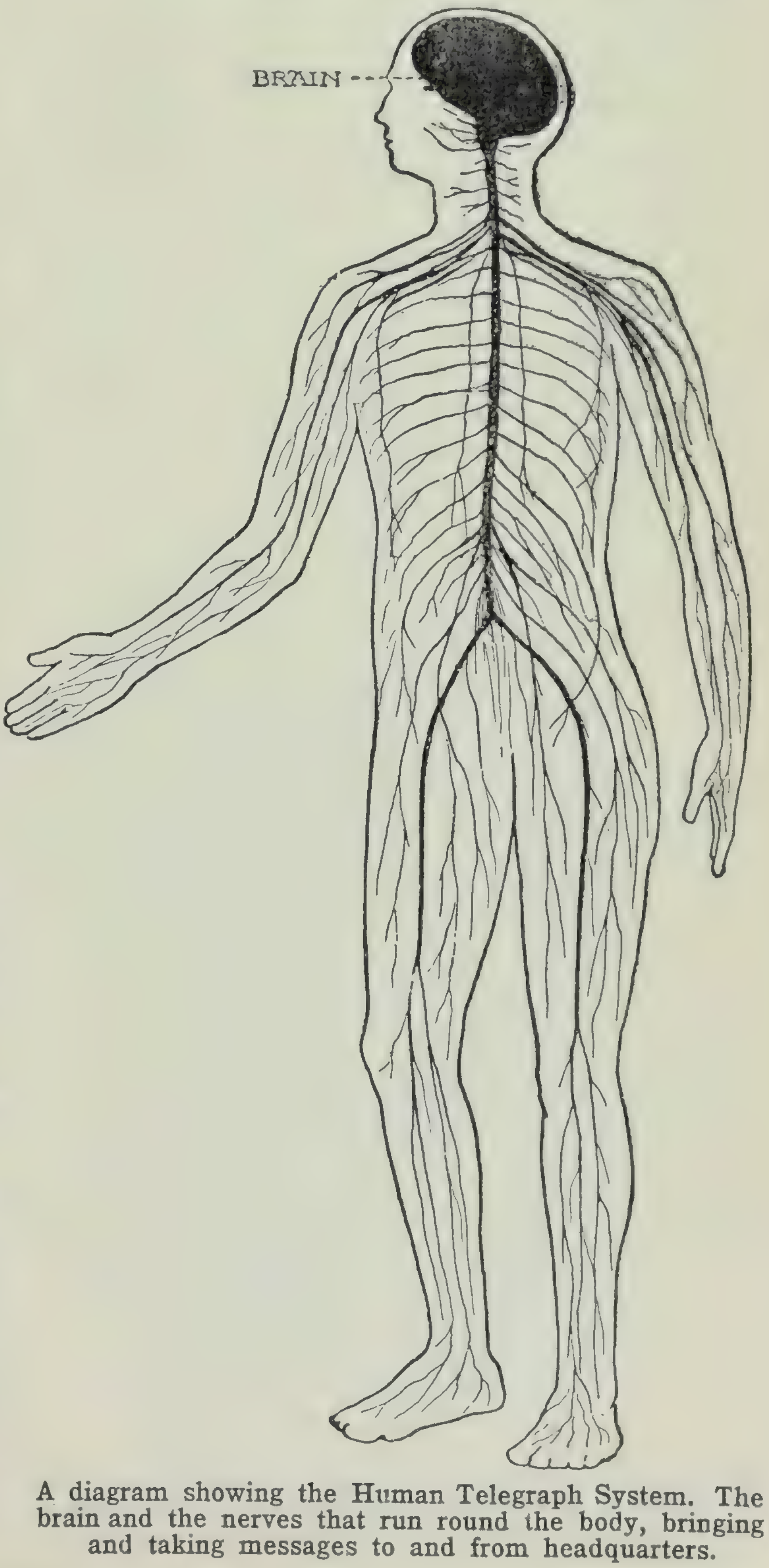
In the same way, any disturbance of the sensitiveness of the skin, the muscles or the eyes will affect our balance. Should, for instance, the sense of touch be lost in the soles of our feet, as it may be as a result of certain illnesses, then it is difficult to balance the body in the dark or with the eyes shut.

THE DELICATE ORGAN THAT GIVES US A SENSE OF BALANCE.

The chief organ of the body, however, which affects our balance lies inside the ear, and consists of three tiny canals joined together and containing a fluid. A movement in any direction causes a movement in this fluid, which immediately causes a message to be flashed along the nerve telegraph to the control exchange in the hind brain. This then issues instructions to the muscles which restore the balance where necessary. Very probably you have tried turning round rapidly several times and then attempting to walk in a straight line. You stagger and move in the wrong direction; you may even fall down, because the fluid in the tiny balancing instrument has been swirled round rapidly and has continued to swirl for some time afterwards.

WHY DO WE NEED TO GO TO SLEEP AT REGULAR INTERVALS?

It is not wise to depend upon the eyes or the sense of touch alone to keep our balance. When we first learn to ride a bicycle and try to ride in the dark, we find we wobble badly



A diagram showing the Human Telegraph System. The brain and the nerves that run round the body, bringing and taking messages to and from headquarters.

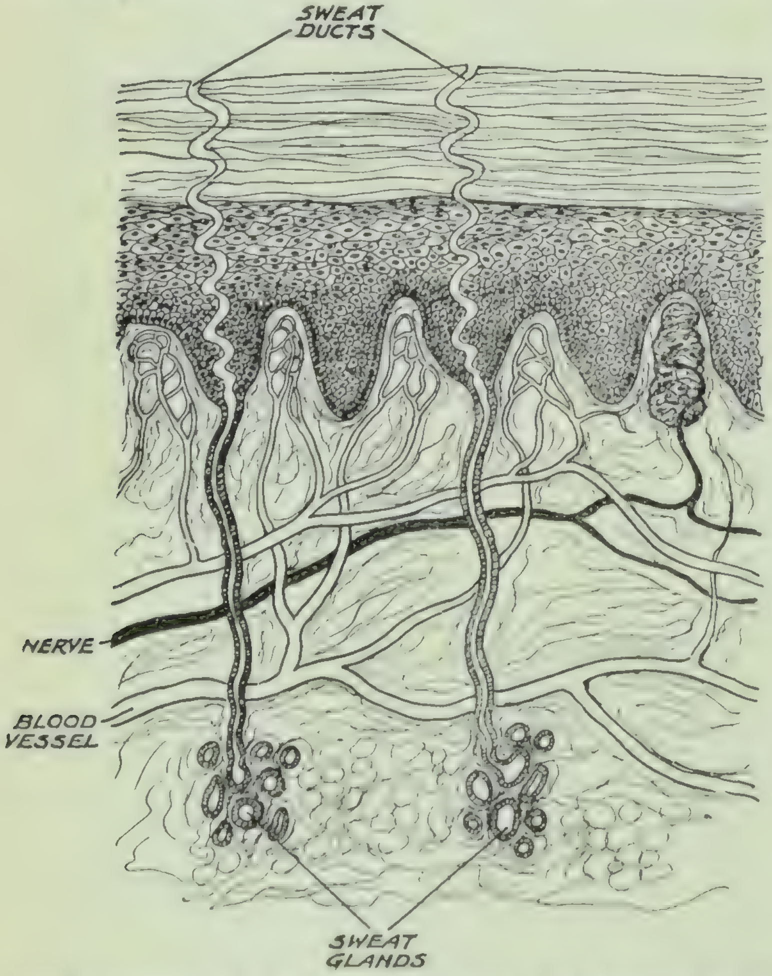
and have to learn all over again—for we learnt to balance by sight alone, whereas at night we have to depend entirely upon the tiny canals inside the ear.

Most of the organs constantly at work in our body are cleverly arranged so that they take regular rests during both night and day. The heart-pump rests for a moment between each beat, the breathing muscles rest between breathing in and breathing out and so on, but the brain, busy at its work of controlling them all, is never at rest while we are awake. Hence it is absolutely necessary that every day it should have a pause when it does no work. It is sleep which provides this rest for the brain, and lack of sleep soon damages its delicate cells. Complete absence of sleep would indeed lead to the breaking up of the cells in a very short time. Experience has shown that we could live for a much longer time without food than without sleep, because we have large reserves of food stored in the cells of our body, but very small reserves of brain energy, which without sleep would be quickly exhausted.

What is the deepest moment of our night's sleep? The depth of our sleep varies, of course, from time to time during the night. During the first half-hour we generally sleep lightly, falling deeper and deeper to sleep for the next two hours. Thereafter sleep begins to lighten gradually until the hour of awakening. Of course, people differ very much in the depth of their night's sleep; there are many of us who sleep very heavily from the moment we lay our heads on the pillow, and who require a great deal of rousing before we awake in the morning.

WHY SKIN IS SO IMPORTANT TO OUR BODIES

WE usually think of the skin simply as an outer-covering for the sensitive organs underneath. Like all the other parts of the body, however, it lives and grows and has its special work; indeed, the skin has four very important duties to perform. First, it protects and supports the deeper organs. Secondly, it has imbedded in it the ends of myriads of tiny nerve-telegraphs, which enable us to feel cold, heat, pain, and the shapes and sizes of objects by the sense of touch. In other words, the skin is one of the important organs through which we understand what is happening in the world outside us.



The structure of the skin, showing the sweat glands which help to regulate the temperature of the body. The nerves which make the skin an important sense organ and the blood vessels are also shown in the diagram.

HOW THE SKIN KEEPS THE BODY COOL IN HOT WEATHER.

Thirdly, the skin helps to keep the body cool in hot weather, for the tiny vessels coming to the surface carry the blood into cooling contact with the outer air. When the body becomes very hot as we play a hard game, the vessels at the surface of the skin open wide and expose a great surface of blood to the cooling air. Sweat, too, pours out through the skin and by evaporation cools the surface, just as water, kept in an earthenware pot in hot weather, evaporates from the surface and keeps the water cool inside. Finally, the sweat which pours out through glands in the surface of the skin carries with it much of the waste matter which is being carried round by the blood, thus helping to rid the body of its harmful poisons.

THE SKIN IS PART OF THE GREAT MACHINE THAT GOES TO MAKE UP THE BODY.

It is clear that the skin is not only protecting the body, but is working all the time as a part of the machine. You will realise that it is important, therefore, that it should be looked after and kept in a healthy state. Then and only then can it do its work properly.

There are two layers of the skin, an outer or *scarfskin*, called the *cuticle*, and an inner layer, the true skin. The scarfskin is constantly being worn off, as for example when we wash our hands, and it is this layer which peels off after an attack of scarlet fever. When a blister forms, the watery fluid gathers between the scarfskin and the true skin. It is on the true skin that the tiny blood-vessels, or capillaries, the endings of the nerve telegraphs, the roots of the hairs and the glands which produce the sweat are situated.

IS THE PATTERN ON THE TIPS OF YOUR FINGERS THE SAME AS THAT ON ANY OTHER PERSON'S?

If you examine the tips of your fingers you will notice that the skin is raised in tiny ridges, which are arranged in ovals grouped in definite patterns. Now, it is chiefly the tips of the fingers which we use for detecting the size and shape of an object, and the ridging of the skin greatly increases the surface available for the nerve-endings necessary for the sense of touch. It is an interesting point that the pattern of these ridges is *never* alike in two persons, and the prints made by the finger-tips of different persons are therefore never the same.

Rooted in the skin on various parts of the body are the layers of cells which we know as the hairs. The outermost layer of a hair is smooth and transparent, each section overlapping the next like the tiles of a roof; the next layer contains colouring matter, while the innermost is made up entirely of soft cells. Hairs vary greatly in thickness, from the fine golden type to the coarser ones which are coloured black and red. A head of golden hair may contain as many as 140,000 separate hairs, a head of dark or red hair on the other hand will not contain more than 100,000. Even that is a surprisingly large number when we consider how small the surface of our scalp really is.

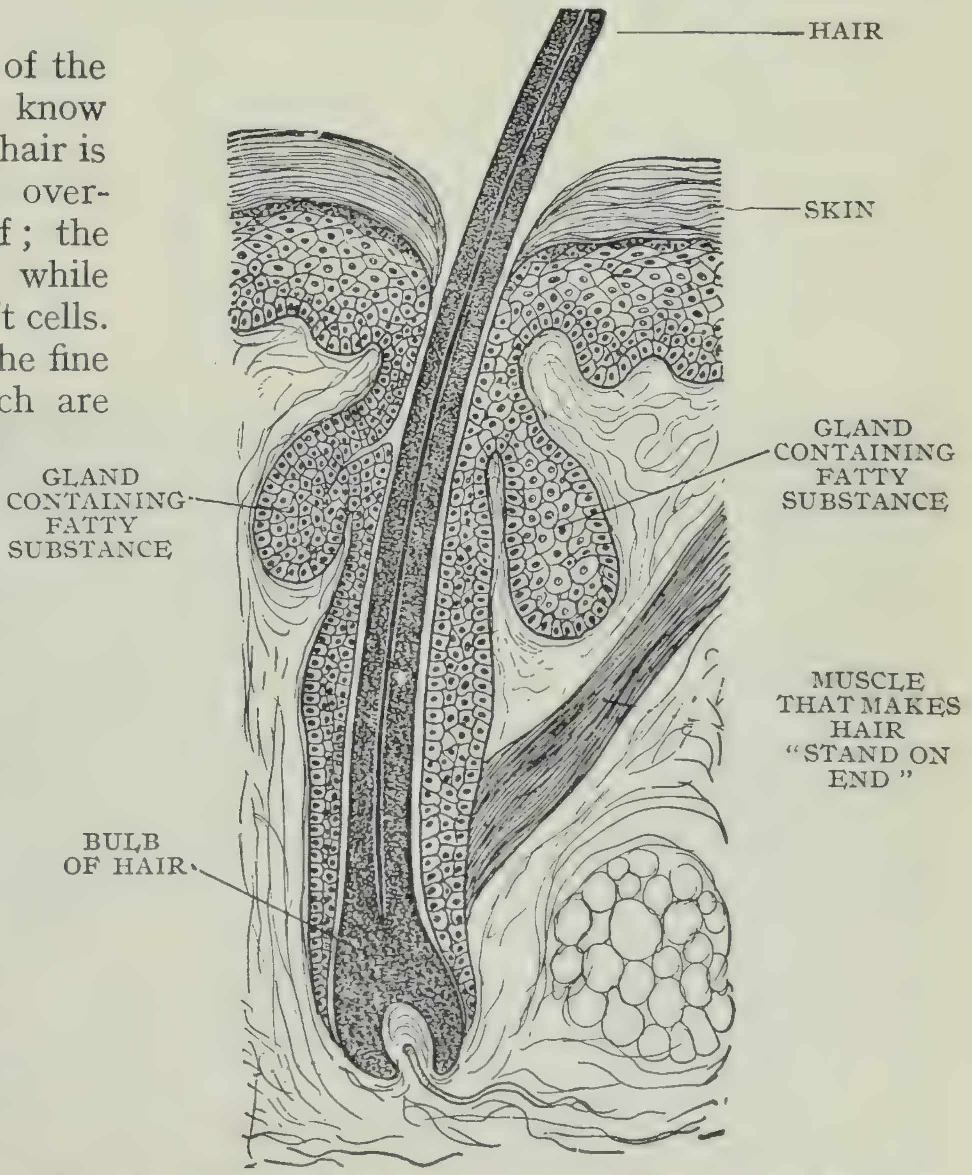
WHAT ARE THE USES OF EYEBROWS AND EYELASHES?

It might seem that our eyebrows and eyelashes are there solely for adornment, and there is no doubt that our faces would look strange without them—but they have other purposes than that. If we had no eyebrows the perspiration would run down from our forehead into our eyes whenever we were playing a hard game. Now, perspiration, as we have seen, is one of the waste fluids of the body, and would be very irritating to the eyes. Hence the eyebrows are placed to absorb this fluid and to prevent possible damage to our eyesight.

HOW LAYERS OF FAT FORM A CUSHION TO PROTECT THE DELICATE NERVES AND MUSCLES.

With the eyelashes, the eyebrows also help to protect the eyes from too strong a light, while the eyelashes form a guardian meshwork to the eye, preventing particles of dust from entering it and damaging the delicate membranes.

Immediately under our skin is a complete coat of fat. It is made up of cells which contain tiny oil droplets, for fat is a liquid at the temperature of our body. The fat cells are enclosed in a meshwork of strands like fibre, which joins the skin to the deeper tissues, and the fatty layer so formed has a number of purposes to fulfil. By its softness it serves as a cushion to pad and protect the delicate nerves, muscles and blood-vessels lying underneath. It forms also a very useful protection against cold, and as you know, animals which


HAIR
SKIN
GLAND CONTAINING FATTY SUBSTANCE
GLAND CONTAINING FATTY SUBSTANCE
MUSCLE THAT MAKES HAIR "STAND ON END"
BULB OF HAIR

Do you ever wonder how your hair grows? It springs from little pits in the skin called hair follicles, and is nourished by surrounding capillaries. You will see these marked in the diagram.

have to live in very cold regions are well clothed in fat, which is the reason why the whale is so well supplied with blubber. Finally, the fatty coat acts as a storehouse for the food which our body saves for emergencies.

The secret of warm clothes is an unexpected one. The warmth of a garment depends not upon the stuff of which it is made, but upon the *air* which is held inside the interwoven strands. Warmth does not pass through still air very quickly, and materials, therefore, which hold a great deal of air keep in the warmth of the body, or, as we say, they are very warm. You will be surprised to learn that ninety-eight parts in every hundred of the weight of a fur is due to the air it contains, and fur, therefore, is very warm. Linen, silk and cotton materials are not good for keeping the body warm, the chief reason being that they are made so that they hold very little air.

Woollen fabrics, on the other hand, are warm because they contain large air spaces. They also take up the moisture which pours out of the sweat glands—if it were left to evaporate on the skin it might cause a chill. Hence, it is a good thing to put on dry woollen garments after a hard game.

Every one has heard of people being so frightened that " their hair stood on end." Is this really possible ? We do know that when cats or dogs are angry or terrified at sudden danger the hair of their coats stands out quite prominently. In fact a smooth haired cat may appear to be twice its natural size when defending itself against a worrying dog. The reason for this is that each hair has a tiny muscle attached to it, and under the influence of a strong feeling like anger or fear this muscle contracts and the hair is pulled erect. In this way the dog or cat is really defending itself, for the hair standing on end is terrifying to the enemy.

In the case of ourselves, the hair is similarly provided with tiny muscles, and *it is possible*, if we are tremendously frightened, for our hair actually to stand on end. More often, however, when we are greatly alarmed, we *feel* as if our hair were on end, though it really has not moved. This is because the tiny muscles contract only partially, not strongly enough actually to lift the hair, but strongly enough to make us feel as if this were happening.

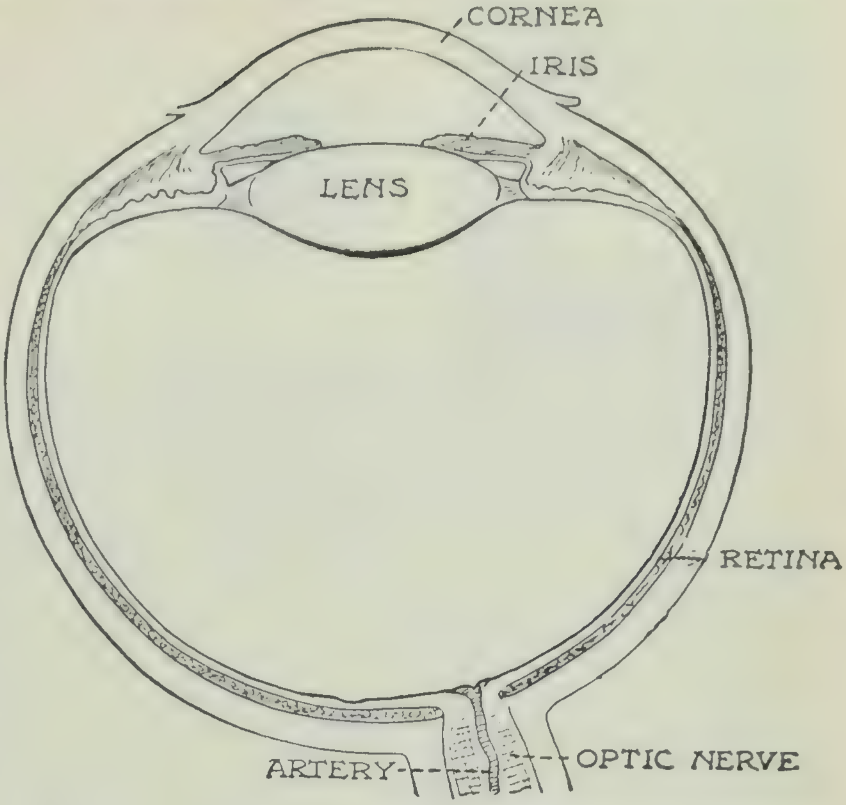
Many people have little white spots on the nails of their fingers, a peculiarity which very often runs in families. These spots are caused by alterations in the arrangements of the cells which make up the nails. Air spaces develop occasionally between the cells and give rise to the opaque white appearance.

Here is another interesting fact about the nails. Do you know that illnesses leave a record of their passing upon them ? If the nails of a person who has had a severe illness be examined within about a year from the date of its occurrence, a distinct ridge will be noticed across them. During the illness, the growth of the nail was stopped owing to the lowered strength of the tissues, and the ridge marks where the new growth has begun.

How does the cat's hair stand on end when she is afraid or is in a temper ? Each hair has a tiny muscle attached to it which contracts and makes the hair stand erect. The same applies to our own hair.

HOW THE HUMAN CAMERA WORKS

A GLANCE at a diagram of the human eye will quickly show you how closely its action resembles that of a camera—or perhaps we should say " how closely a camera resembles the eye," for human beings have had eyes with which they could see for longer than history can tell, whereas we have learnt only quite recently how to make a camera. As you will read elsewhere, pictures of objects outside are focused by the glass lens in a camera on to a sensitive plate at the back of the box which holds them both. The eye too has a lens which works in just the same way, although it is not made of glass, and it focuses a picture of the objects we see on a sensitive screen called the *retina.* The eye does not, of course, then proceed to " develop " the picture ; instead the tiny endings of the nerve-telegraphs send messages describing the picture to the brain, and from those messages the brain, so wonderfully does it work, can understand exactly what the object is like.



A diagram of the eye, showing the iris, which concentrates light rays, the lens which focuses them, and the retina which receives them as an image upon its surface.

DID YOU KNOW THAT THERE IS A "BLIND SPOT" IN YOUR RIGHT EYE ?

Before taking a picture with a camera, we focus it carefully by moving the lens. The eye does exactly the same, not by moving the lens, but by changing its shape, so that a sharp and clear picture of objects at very different distances can be made to fall upon the retina. Just as in the camera, too, we arrange the size of the " stop " or movable diaphragm in front of the lens to let in more or less light, so the eye can change the size of the iris for the same reason. This explains why a cat can see so well in the dark, for the opening in its eyes, which is a tiny slit only in strong daylight, becomes round and wide at night time, to let in as much light as possible.

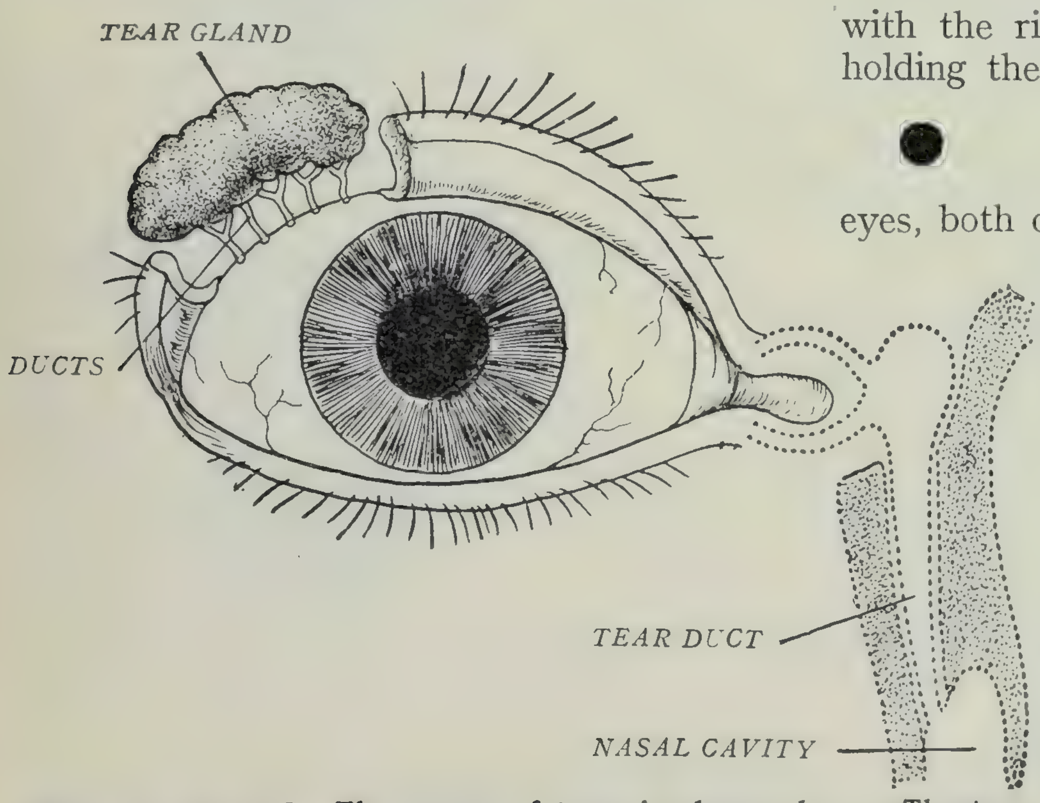
The tiny nerves which end in the retina collect into a bundle and leave the eye as a thick nerve which is not affected by light. Hence we cannot " see " with the spot on the retina at which the nerve leaves.

TRY THIS EXPERIMENT AND TEST YOUR EYESIGHT.

If we close the left eye and look fixedly with the right eye at the dot shown here, holding the page about six inches from the eyes, both dot and cross can be clearly seen. If, however, we now move the page slowly away from the eye, still keeping the right eye fixed on the dot, we shall find that the cross suddenly disappears from view. This is because the picture of it formed by the lens has fallen on the " blind spot." If now we move the page away still farther, the cross will come into sight again.

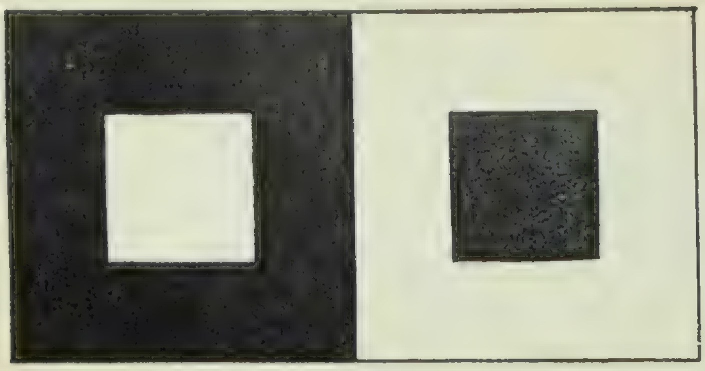
●   X

We do not usually notice our " blind spot," because it has been there ever since we were born, and we have come to neglect its blindness.



Why do we cry ? The source of tears is shown above. The tear gland secretes fluid to cleanse the eye, and the tear duct drains the fluid away into the nose.

HOW THE NORMAL EYE CAN BE DECEIVED



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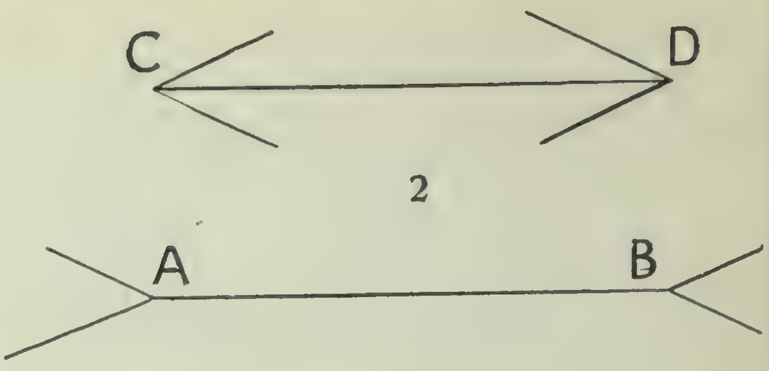

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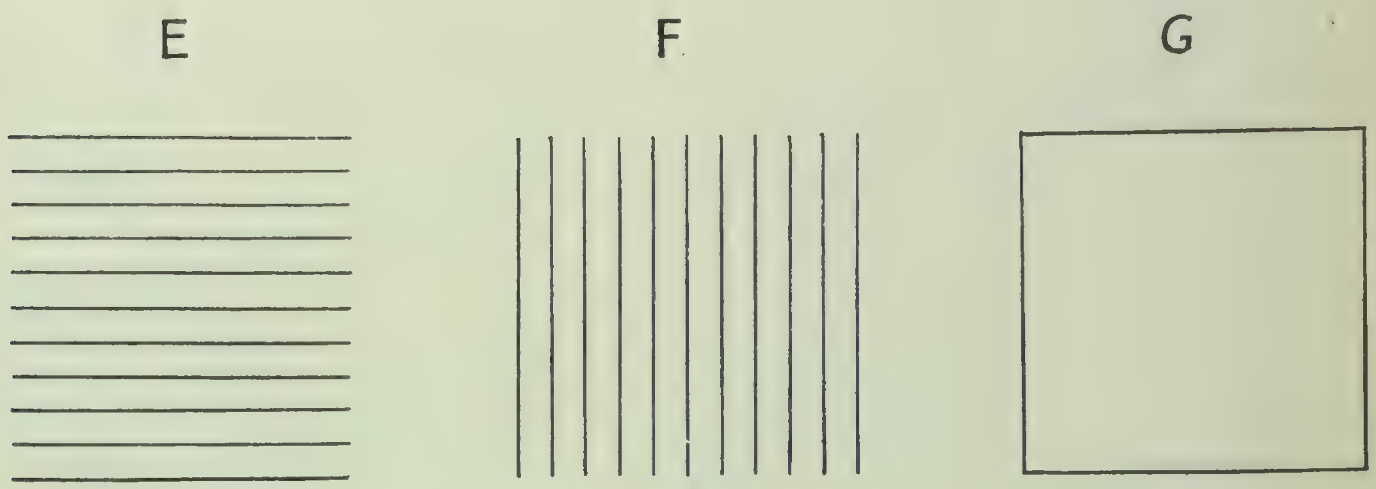

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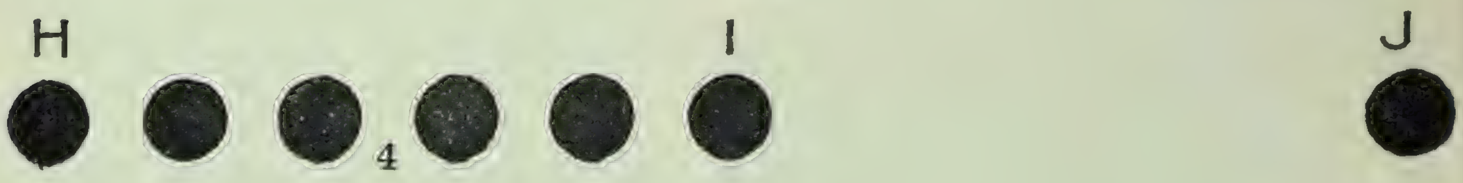

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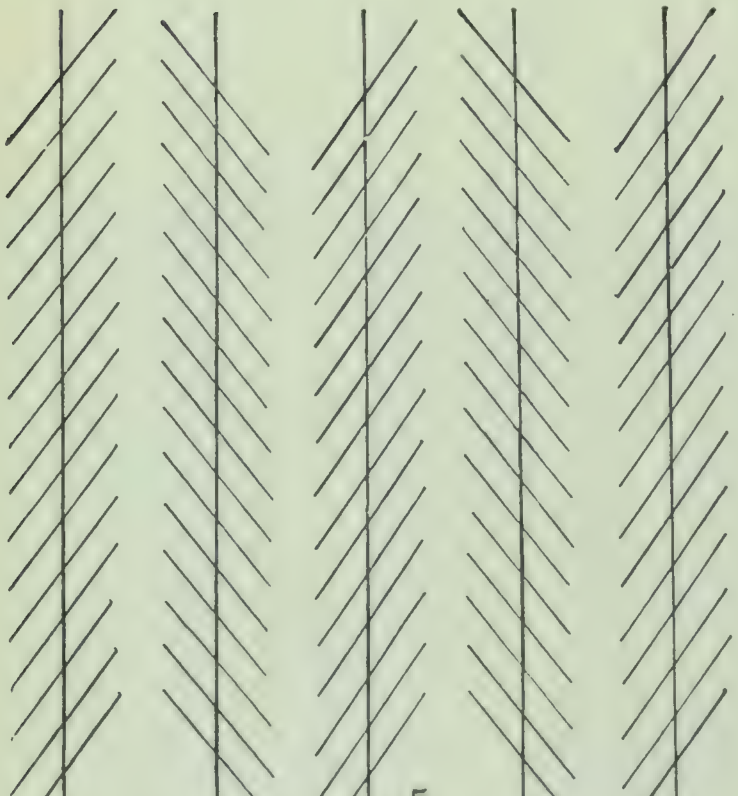

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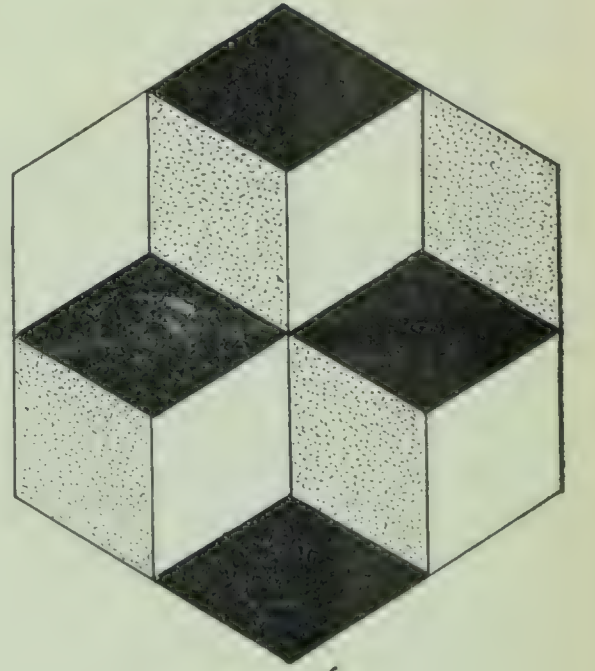
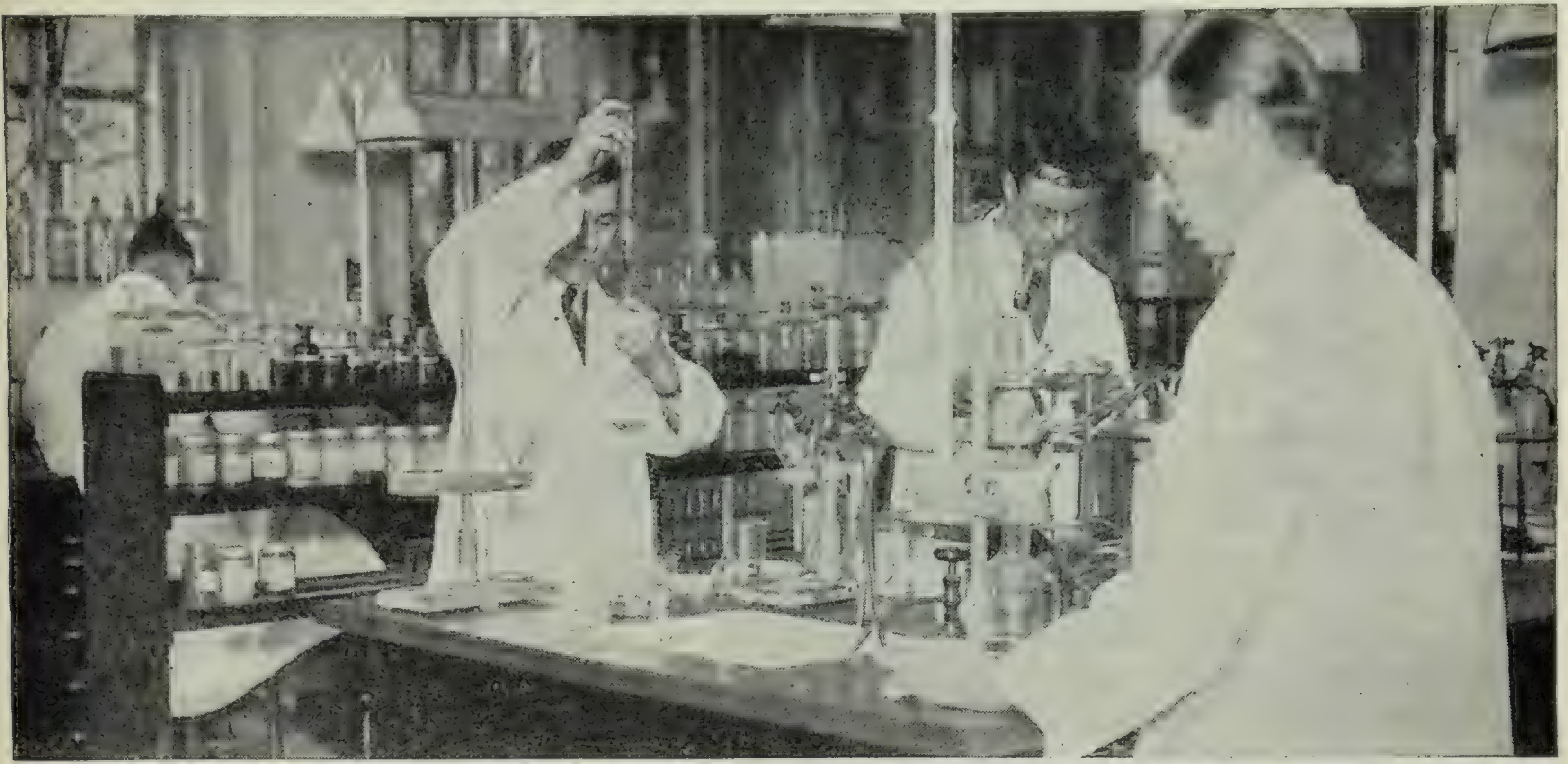


6

(1) Effect of background—which square is the larger? (2, 4, and 5) Effect of neighbouring objects—the lines AB and CD will be found to be the same length : the distance from H to I is equal to that from I to J : the vertical lines in (5) are parallel. (3 and 6) Effect of shading—E, F, and G are the same size : the cubes can appear either black-topped or black-bottomed, changing the structure of the pyramid. .

When the picture of an object falls upon the retina, it makes a change there which lasts an appreciable time, in fact, for about one-eighth of a second, so that the retina is not immediately free to receive a new picture. Hence, when the pictures are coming in very rapidly, as when we look at the spokes of a swiftly revolving wheel, we cannot distinguish between one picture and the last, so that when the wheel is turning fast enough, the pictures are jumbled together on our retina and we cannot see the separate spokes at all.

THE MYRIAD TINY ENEMIES OF MAN



The danger of germs lurking in our food and spreading infectious diseases is causing doctors a great deal of concern. Investigations are being made to discover any impurities and to exterminate the germs before the food reaches us. [*Keystone*

Everywhere there abound millions upon millions of tiny living things, so small that they can be seen only under the most powerful microscope. Some of these *germs*, as they are called, are no wider than a twenty-five thousandth part of an inch! They are of various shapes, some (called *cocci*) being round like a globe, others, called *bacilli*, being shaped like a rod. Like all living things, they grow and multiply, and as a result of their growth they produce substances which may act as poisons in our bodies. Germ poison-factories, indeed, are responsible for most of the illnesses which attack man during his lifetime.

LIVING CREATURES TOO SMALL TO BE SEEN BY THE MICROSCOPE.

Not all the germs which are everywhere in nature are harmful to man. Some, in fact, are actually helpful to him. The brewing of beer, the ripening of butter, the tanning of leather, are examples of processes during which germs work to help man, but unfortunately many of the most serious diseases—tuberculosis, diphtheria, typhoid, lockjaw, cholera, plague, pneumonia and many more—are the result of an attack by particular kinds of harmful germs.

Some germs are so small that they cannot be seen through the most powerful microscope known to man. How then do we know that they exist? Doctors have noticed that certain diseases are *infectious*, that is, they can be passed on from one person to another, although no germs can be detected which could cause the disease. It *has* been found, however, that if fluid from a part of a body which already has the disease is filtered through a very fine porcelain filter, the solution which comes through will still produce the disease again in a healthy animal. Hence it is thought that very very minute living germs must exist in this solution, even though they cannot be seen with our present day microscopes. Some of the diseases which are believed to be due to such germs are infantile paralysis, sleepy sickness, measles and small-pox.

HOW THE DISEASE GERMS SWARM IN THEIR MILLIONS, EVERYWHERE.

It is possible to grow most germs in test-tubes, provided we give them a nourishing fluid as warm as the blood of our body in which to live. It has been found in this way that germs multiply in number very rapidly

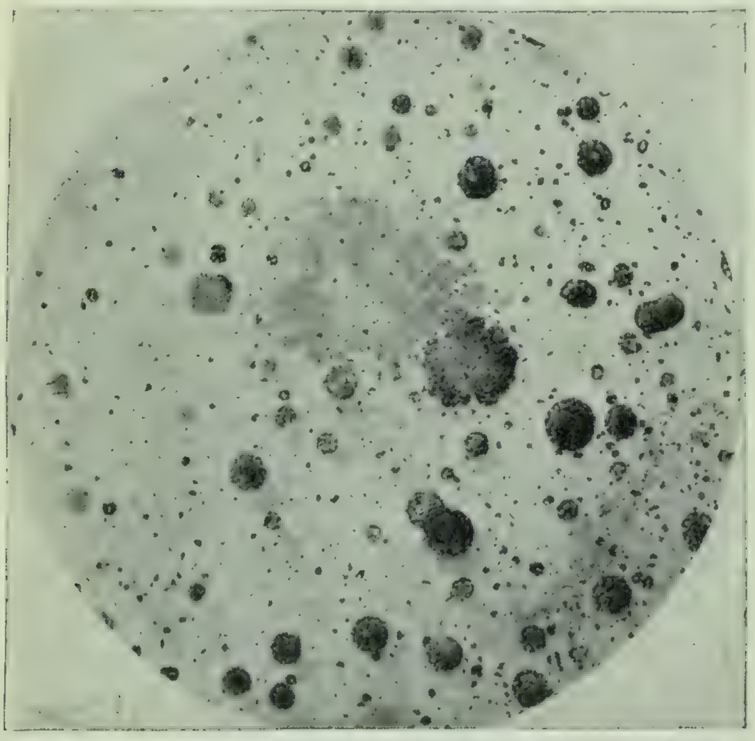
Drinking from vessels used by others is one way of picking up disease germs. The above method of drinking from a jet of water is safe and healthy. [British Continental

indeed. A germ divides into two in about twenty minutes, so that the descendants of one germ could amount to 34,000,000 in *twenty-four hours!*

Disease germs are found in particles of dust and moisture which are carried in the air, and coughing and sneezing are common ways of spreading them so that they attack other people. They may also be spread in drinking water, or in food, and that is the reason why milk, in which the germs thrive particularly well, is so often *pasteurised* nowadays. This process is named after Louis Pasteur, the great French scientist who first proved germs to exist, and it consists of heating the milk to a temperature at which the germs cannot live.

HOW THE WHITE CORPUSCLES OF THE BLOOD DEVOUR GERMS OF DISEASE.

The germs in the air *can* be counted. The number which are around us and ready to attack, especially in crowded rooms, is tremendous. Certain scientists counted 42,000 germs in a little over a square yard of the air of an empty picture gallery; when the gallery was crowded with people they found nearly 5,000,000 germs in the same space. In the open air germs are less abundant, and there are fewer in country air than in town air. Thus the pure air over the ocean contains only four or five germs in the same space as in the crowded picture gallery contained 5,000,000. We see at once how important it is, therefore, that we should live as much as possible in the open air, and that the rooms in which we live should always be well ventilated with fresh air.



One of the greatest dangers to the health is impure milk. The above picture shows a drop of unclean milk under the microscope. Millions of germs live in a teaspoonful.

We heard of the army of white corpuscles when we read about the blood. Whenever disease germs attack any part of our body, all the forces of defence gather together immediately to repel the invasions. The white corpuscles have a simple way of destroying the germs—they eat them! If the germs are not suitable for eating, then they are first made acceptable by a substance carried by the blood called *opsonin.*

In the watery part of the blood there are chemical substances able to kill some of the germs, and other substances which clump them together so that they cannot move about.

It is the poisons produced by the germs which do all the harm in our bodies, so that another way of defeating their attack is to have an antidote to the poison ready to destroy its effect as soon as it is formed. The blood is able to make some of these antidotes, and doctors can prepare others for the poisons which produce diseases such as diphtheria and lockjaw.

Truly, a great battle is being waged in our bodies. When the germs win in the conflict, then we become ill, but fortunately the armies of defence are more often able to repel them, so that the whole wonderful machine can carry on its work without interruption.

CAN WE ESCAPE FROM GROWING OLD?

NO two persons are alike, either in body or in mind. We all differ in the size of our bones, in the texture of our skin, in the quantity of hair on our head, in the warm clothing of fat which covers our body, in our moods and our feelings and the strength we have to endure hardship. We are all cast in different moulds, and it is only quite recently that a group of brilliant scientists have been able to offer an explanation, in part at least, of why this is so.

Situated in widely separated parts of our body are little groups of cells to which we have given the name *glands.* These groups have for their special work the making of chemical substances called *hormones,* which are poured directly into the blood as it passes round the body in its life-bringing task. Hormones are chemical messengers, which go to all parts of the body, having a very important effect upon the cells which they encounter on their journey.

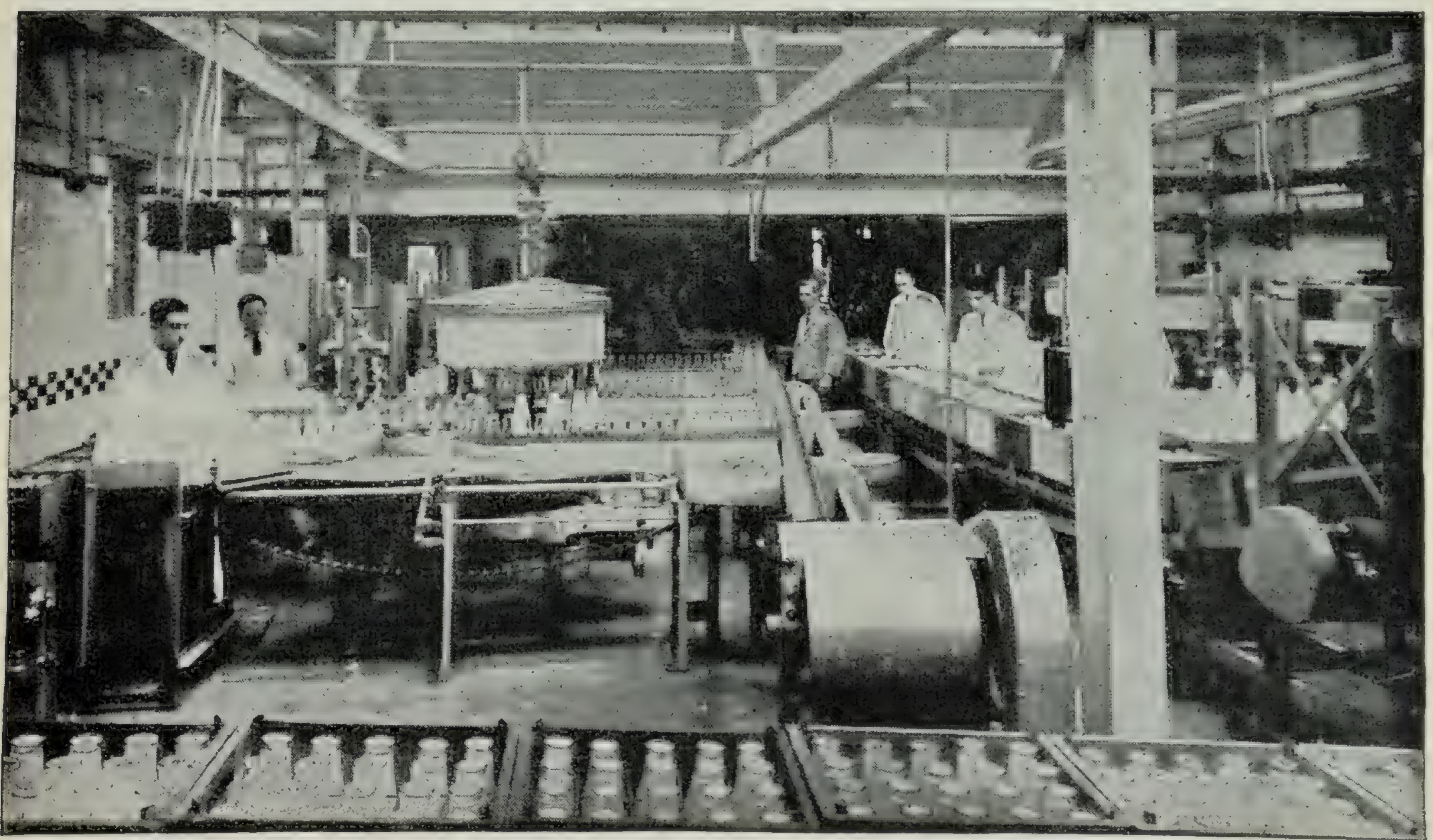
HOW A GLAND PLAYS SUCH AN IMPORTANT PART IN THE BODY.

One of the best known of these glands is situated in the neck, and is called the *thyroid.* It is busy continually preparing a chemical messenger which is rich in the deep violet substance which we know as *iodine,* and it plays an important part in controlling the way in which children grow up. If the thyroid cannot prepare enough of its messenger, as sometimes occurs, the child will never properly grow up. He will be small, and will have very little hair on his head and his skin will be thick and coarse. Above all, his brain will never be able properly to take control; he will be dull and will always think like a young child.

THE LITTLE GLAND THAT DECIDES WHETHER WE ARE TO BE TALL OR SHORT.

Now, it is possible for such a child to be *made* to grow up. Doctors can perform, in many cases, what is almost a miracle and reminds us of fairy-tales where dwarfs are changed into giants. The chemical messenger which is missing can be obtained from certain animals such as the sheep, and given to the child to carry its message of growth to the sluggish cells. Very remarkable results indeed have been obtained by this treatment, for the stunted body develops quickly and the tired and lazy brain becomes rapidly bright and alert.

One of the smallest of these wonderful glands which prepare the messengers is placed at the base of the brain. It is called the *pituitary gland,* and though in size it is only as big as a pea, it has an amazing effect upon the whole growth of our body. Actually, it



Now that milk has become an important item of our diet, we have to guard against its being contaminated. A French chemist, Louis Pasteur, discovered after many researches how to purify milk. The method used is called pasteurisation, and to-day in most big dairies milk goes through this process, and still retains the vitamins which make it so health-giving.

makes two different kinds of chemical messenger, and if it does not do its work properly when we are young, and makes too much of one kind, then we grow up to an enormous size—we become giants, in fact. Such giants have been known as tall as eleven feet or more! If, later in life, damage is done to the gland which is working properly, and it begins to produce too much of the same messenger, then the whole skeleton increases in size, to huge proportions. The hands and feet get very big and it is often the need for larger gloves and shoes which first draws attention to the disorder.

WHY DO WE ALL EVENTUALLY BECOME OLD AND WORN OUT?

On the other hand, if the gland does not produce enough of the same chemical messenger when we are young, our growth remains stunted, as can be seen with some of the queer tiny dwarfs which are found in the circuses which travel about the country and attract crowds by their odd appearance.

We all dread growing old and strive to preserve our youth for as long a period as possible.

For many centuries scientists have been trying to discover how to prolong human life beyond the natural span and have made many experiments, without much success. They have hoped to find the "Elixir of Life"—a substance which would give perpetual youth. Well, it is too much to say that to-day we have discovered this secret, but we do know that a certain gland makes chemical messengers which keep us young, and that old age results from the gradual failure of this gland to keep up its proper supply.

IS IT POSSIBLE FOR OLD PEOPLE TO BE MADE YOUNG AGAIN?

Within the last few years experiments have been carried out by a surgeon in France, Serge Voronoff, who has transplanted the special gland from a healthy young animal to a very old man and astonished the world with his new ideas. In many cases he achieved very wonderful results, the signs of old age disappearing and youthfulness beginning to appear again. This *rejuvenation*, as it is called, does not yet last very long, but it seems that in the near future it will not be impossible by improved methods to add quite a number of years to the accepted span of life. Clearly, these chemical messengers which travel the high road of our blood circulation have an amazing effect upon the destinies of our lives.

Doctor Serge Voronoff, the Russian surgeon, here seen at his desk, has performed many wonderful operations of gland-grafting. By renewing worn-out glands in an aged human being, he has been able to give new life and vigour to the patient, thus proving that we grow old when that special gland ceases to do its work properly. [*Topical*

REVELS IN THE LIFE-GIVING SUNSHINE

Exercise in the clear sunshine at the seaside, where the life-giving rays come down to us without loss of healing power, is a tonic to the body and mind. The smoke-laden atmosphere of the town acts as a screen and robs us of the ultra-violet rays sent by the sun to stimulate life. Try this method of acquiring a graceful carriage. [*Keystone*

HOW SOAP AND SUNLIGHT BRING HEALTH

" That's the life for a man like me ! " Over ditches and fences they rush, tingling with health, and eager to be first at the end of the race. Exercise in the open country where the sun reigns supreme is the best high road to health.

Enjoying their beauty treatment ! Keeping the skin clean and healthy is one of our first duties to our bodies. Dirt always attracts our enemies, the disease germs, that lurk about ready to take advantage of our lack of cleanliness.

FOLK STORIES OF THE NATIONS

Once more we visit other lands to hear some of the old folk stories handed down through the ages. Our first takes us to ancient Egypt. Thence we visit the Red Indians of North America, moving from their land to Norway, land of fiord and waterfall. Lastly, we have a story from the Caucasus region.

THE TWO BROTHERS

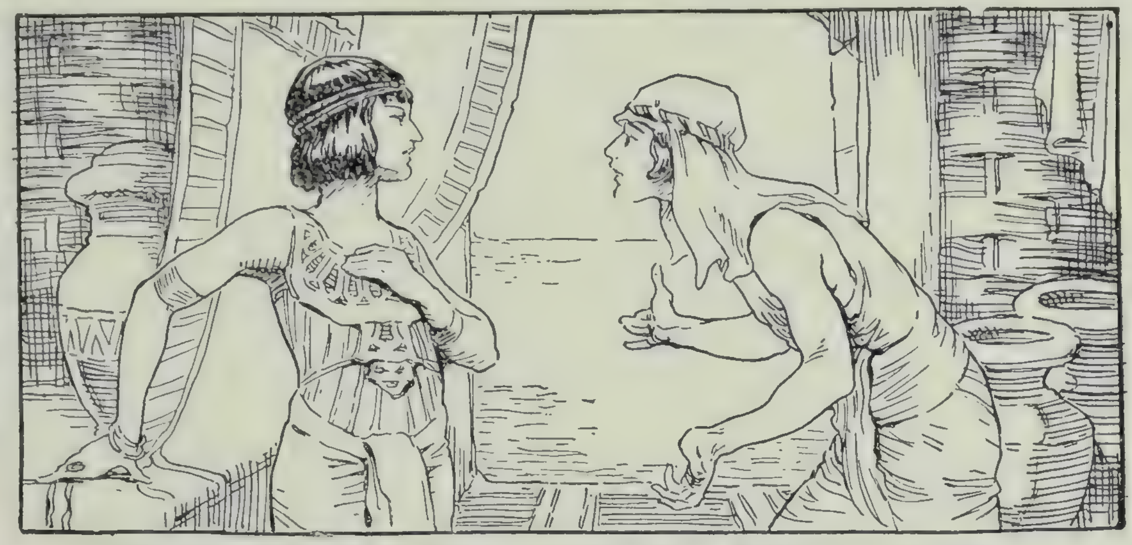
BITOU and Anapou were two brothers who lived in the land of Egypt about three thousand years ago.

Anapou was the elder brother, and he owned the house, the herds, the flocks and the land. Bitou, the younger brother, worked as a labourer upon his brother's farm.

HOW BITOU TOOK OUT HIS HEART AND HUNG IT ON A TREE.

Now Bitou, the younger, was much cleverer than Anapou at this kind of work. He knew all there was to know about seeds and crops, ploughing and tilling, hoeing and reaping. He could even talk to the cows in their own language!

For this reason Anapou's wife was jealous of Bitou, and she tried to set her husband against him.


" But how shall I know when you need me ? What is to be a sign ? "

One day Anapou sent Bitou back to the house to fetch some seeds that he had forgotten. Anapou's wife refused to give him the seeds. She hid them instead. Bitou had to return without them.

As Bitou was a long time returning, Anapou himself went to fetch the seeds. When he entered his house, his wife was lying on the floor, pretending to be ill. She said that Bitou had beaten her and thrown her to the ground!

This, of course, was not true, but Anapou believed his wife's story, and went out in search of Bitou, meaning to have his revenge.

But Bitou told him the true story of what had happened in the house.

" Your wife is jealous of me. She has always wanted to get rid of me," said poor Bitou. " I will not live in your house any longer. I do not trust her. I am going to the land of the Acacia, and so as to be free of all trouble, I will take my heart out, by magic. Yes, I will take it out and hang it on the highest bough of the Acacia tree. If the Acacia tree should be cut down, and my heart should fall, then you, my brother, must come and help me. Heed my words, for it will be well with you if you do so ! "

Anapou was troubled. He did not want to lose his brother. He said :

" But how shall I know whether you will need me ? What is to be a sign ? "

Then said Bitou : " It shall be a sign that the tree is cut down when you will have a jug of beer brought you with froth at the brim! Good-bye, brother ! "

So saying, Bitou went away.

He came at last to the Land of the Acacia, and so that he should feel no trouble, he tore out his heart, by magic, and he hung it upon the highest branches of the Acacia tree.

BITOU MARRIES A BEAUTIFUL BUT CRUEL DAUGHTER OF THE GODS.

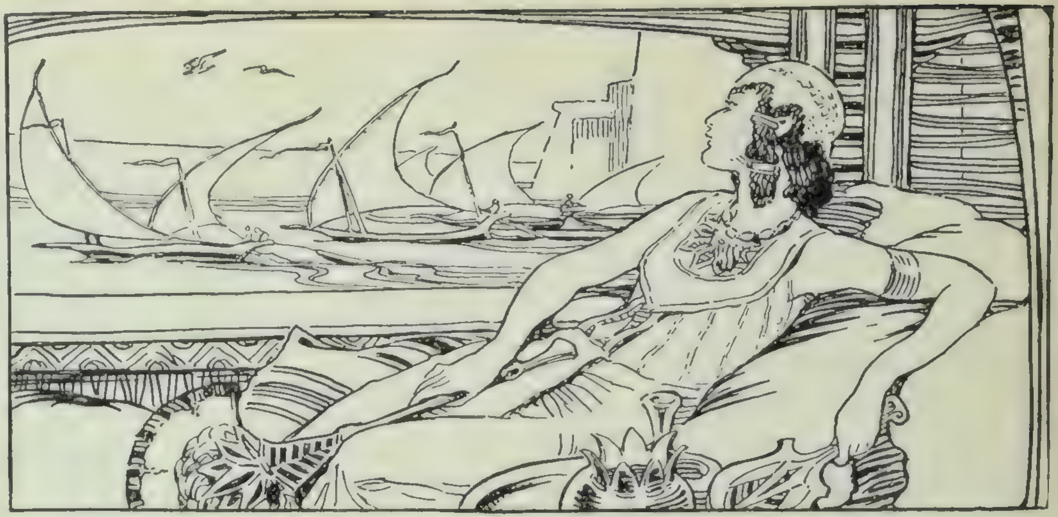
He lived very happily. By day he tilled the land and grew his crops, he hunted the wild animals for food, and by night he slept under the sheltering branches of the Acacia tree.

He chose a wife who was very beautiful. She was a daughter of the gods. For a time all went well. But Bitou's wife, though a daughter of the gods, was not to be trusted any more than his sister-in-law had been !

Pharaoh, the King, had heard of her great beauty, and one day, whilst Bitou was out hunting in the forest, Pharaoh sent messengers to entice the fair lady away from her home.

She was not unwilling to go. She longed for riches, she declared, and the King's messengers assured her that at Pharaoh's palace she would be surrounded by all kinds of wealth and luxury.

So she went with them and she came to the palace of Pharaoh. For several days she lived there happily, quite forgetting Bitou, her poor husband. Then one day something happened to remind her of him. She longed now to be rid of him, so she went to Pharaoh and she told him the secret of Bitou's heart and where it was hidden.


At Pharaoh's palace the beautiful lady was surrounded by wealth and luxury.

" Send some one, O mighty Pharaoh, and let him cut down that tree ! " said the crafty woman. " Then his heart will be lost forever and he will die."

HOW BITOU DIED AND CAME TO LIFE AGAIN AFTER HIS BROTHER HAD SOUGHT HIM.

So Pharaoh sent a man to cut down the Acacia tree. When it had been cut down, Anapou, the brother, had a foaming jug of beer brought to him. He remembered that this was a sign.

" My brother is in trouble. He needs my help," he cried, and away he went to the Land of the Acacia.

When at last he came to it, he found poor Bitou lying dead upon the ground. Anapou searched for the Acacia tree and found it cut down, its branches and leaves already beginning to wither.

But he could not find his brother's heart, and saw only a large berry on the highest bough.

" Perhaps that contains my Bitou's heart," said Anapou.

He picked the berry and put it into a dish of water. As it revived, so also did Bitou ! Then to the brother's great joy, Bitou sprang from the ground, alive and well ! How glad they were to see each other again !

" Now," said Bitou, " I am going to change myself into a sacred bull. Then you must take me to Pharaoh. He will give you a rich reward of silver and gold for bringing me. When I am in the palace, I shall see my former wife and I will have my revenge. I will punish her for betraying me."

On the following day Bitou, having taken the form of a sacred bull, was led by Anapou to the palace of the King.

Anapou was given much gold and silver, as Bitou had foretold, and Pharaoh was greatly pleased.

The bull was allowed to wander about the palace at his own sweet will. One day he made his way into the room occupied by his faithless wife. " You see I am still alive ! " he roared.

The woman was much frightened.

" Who are you ? " she cried. " And what do you want here ? "

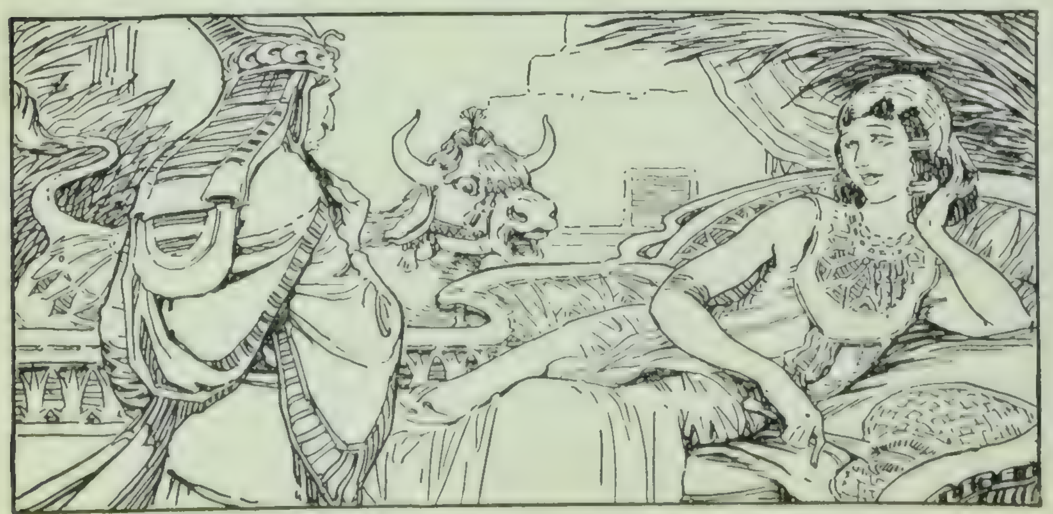
" I just wanted you to know that I am Bitou, your rightful husband ! " said the bull, and then he wandered away.

HOW PHARAOH WAS COAXED TO KILL HIS SACRED BULL.

Now the woman was secretly troubled. She did not know what to do. At last she hit upon a plan. She went to Pharaoh and she said : " I want to eat the liver of the sacred bull. Give it to me, I pray."

Now Pharaoh loved the sacred bull and he was most unwilling to have it killed. But he loved this cruel woman more! So at last he consented.

Two men were despatched to kill the bull. The animal was tied, and the men did their horrid task. But two drops of blood trickled down from the bull's neck and they


" I want to eat the liver of the sacred bull," cried Pharaoh's wife.

formed little streams that flowed down, one on each side of Pharaoh's door!

There, to the great surprise of everybody, they sprouted up and grew into two tall trees. They were Acacia trees!

The people bowed down to these two trees, and worshipped! Pharaoh and Bitou's wife were carried out in their stately chairs, and they were set down, one under one tree, one under the other.

The tree underneath which sat Bitou's wife bent down its branches, and it whispered: "You see, I am still alive. I am Bitou!"

The woman was much afraid. When she returned to the palace she went again to Pharaoh.

"Cut down that tree, my beloved! Cut it down. I want its wood for a beam in my ceiling!"

And at first Pharaoh would not think of having it cut down. He loved that Acacia tree. But he loved the woman still more.

So he had the tree cut down, and whilst the tree that was Bitou was being chopped, a splinter of wood flew from it right up into the woman's mouth. The woman herself was killed, but Bitou, the undying one, came to his own form at last!

He told the true story of his life to Pharaoh, and then Pharaoh loved him greatly. He set him up to be chief ruler in the land.

But the memory of that dead woman Pharaoh hated!

SCARFACE AND THE SUN-GOD

SCARFACE was an Indian Brave. He had neither father nor mother, for they had both died when he was still a baby. He was very poor.

The other braves made fun of him. They made fun of his scar which twisted the whole side of his face up, and they said that he could never succeed. But the older braves liked him.

Now the Chief of the tribe had a beautiful daughter. All the young braves admired her. So did Scarface, but he could not hope that she would ever marry him, for he was so ugly.

But one day as he passed by her door, she looked at him. He raised his eyes to hers, and then he told her what was in his heart.

"I am poor," he said, "and I am ugly, but I love you."

"I love you," she said, "I can never marry you, for the Sun-God has laid a spell upon me. He says that I may not marry."

Scarface was troubled.

"If you love me, give me leave to visit the Sun-God. Perhaps I can make him break the spell."

"I do not think you will succeed. The Sun-God is very powerful. But if, by any chance, you do, ask him to remove that scar to prove the spell is broken."

Off went Scarface at once. He swung through the thick forests, he climbed over the hill-tops, he swam across wide rivers. But, at last, his heart grew heavy. He did not seem to be any nearer his goal.

He asked the wolf how much farther it was to the Sun-God's palace. But the wolf did not know. He asked the badger and the beaver. Neither of them knew.

At last he came to a wide river. This one was too wide for him to swim across, but a large, white swan came lazily up to him.

"Where are you going?" she asked.

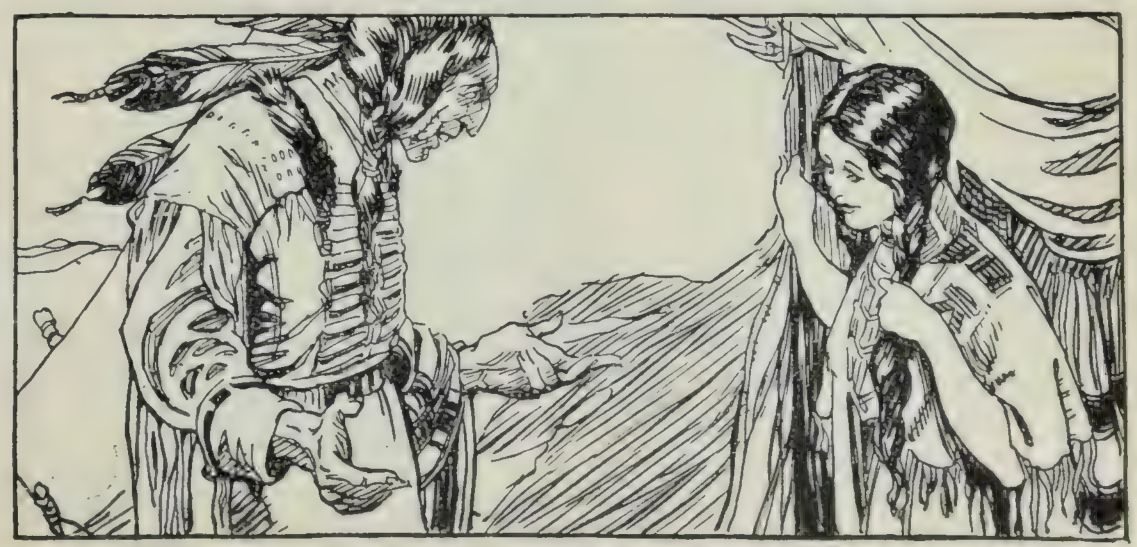
"I am trying to find the Sun-God," said Scarface. "Do you know where he lives?"

"Yes," replied the swan. "Get on my back and I will take you across. Then I will put you on the right road."

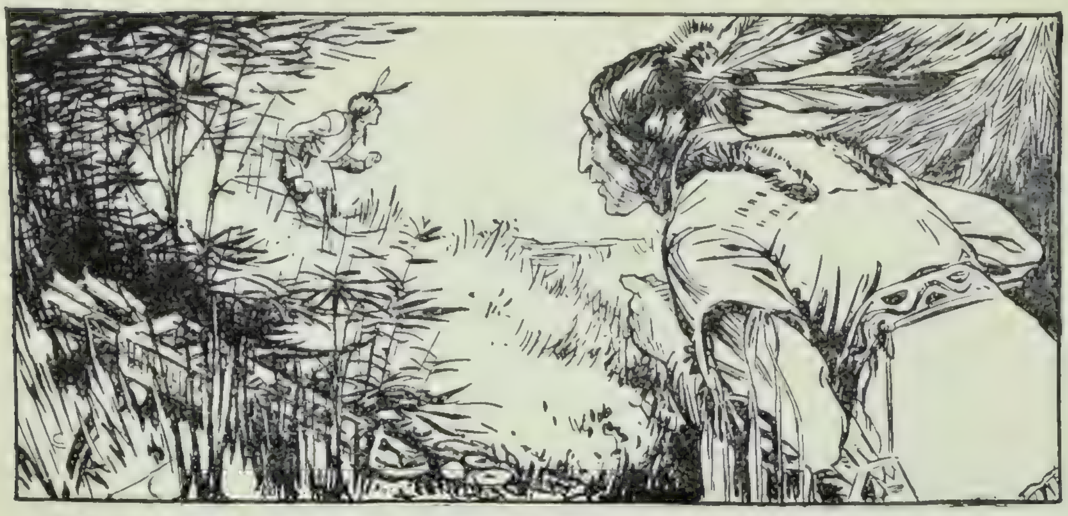
THE SWAN FERRIES SCARFACE ACROSS THE RIVER AND SHOWS HIM ON HIS WAY.

Scarface was delighted. He jumped upon the swan's broad back and soon he was on the other side of the river.

"There," said the swan, "is the road to the



"I am poor," he told the Chief's daughter, "and I am ugly, but I love you."



He discovered some arrows and a bow half-hidden in the long grass.

Sun-God's palace. Keep along the track and you will soon come to it."

The young man thanked the kind swan and he walked along the road. Soon he came to some arrows and a bow, which were lying by the side of the track. They were half-hidden in the long grass.

MORNING-STAR, THE SUN-GOD'S CHILD, TAKES SCARFACE TO THE PALACE.

A dishonest man might have been tempted to pick them up and keep them. But Scarface let them lie, for they did not belong to him. Soon he met a handsome youth.

" Good-day," said the youth. " I have lost my bow and arrows. Did you see any as you came along ? "

" Yes," replied Scarface. " They are lying in the grass about twenty paces behind."

" I am glad to see you are so honest," said the youth. " I will go and find them. But tell me who you are, and where you are going ? "

" My name is Scarface, and I am seeking the Sun-God."

" Then come with me. I am going that way. I am the Sun-God's child, and my name is Morning-Star ! "

Scarface was overjoyed to think that at last he was at his journey's end. He waited whilst his companion fetched his arrows, and then together they went along the track.

The Sun-God's palace was so dazzling and so bright that Scarface could hardly see. At the entrance stood a beautiful woman, the mother of Morning-Star.

She greeted them kindly and invited them to come inside. Then Scarface was at last in the presence of the great Sun-God himself !

He was very kind and he bade Scarface stay and be his guest.

Next morning, when Morning-Star said that he was going hunting, his mother warned him not to go near the Great Water.

" There are evil spirits in the shape of birds near the Great Water. They will seek to do you harm," she said.

But Morning-Star laughed. He said he did not care, and as soon as he was out of his mother's sight, he said to Scarface :

" Come and let us hunt the evil spirits that fly like wild birds."

Scarface went with him. The fight that followed between the evil birds and Scarface was long and very terrible. Morning-Star fell to the ground. But Scarface spent arrow after arrow until he had no more left. Then he finished off the birds by wringing their necks !

HOW SCARFACE BECAME SMOOTHFACE AND LIVED HAPPILY EVER AFTER.

Morning-Star had a fine tale to tell his father when at last they reached home.

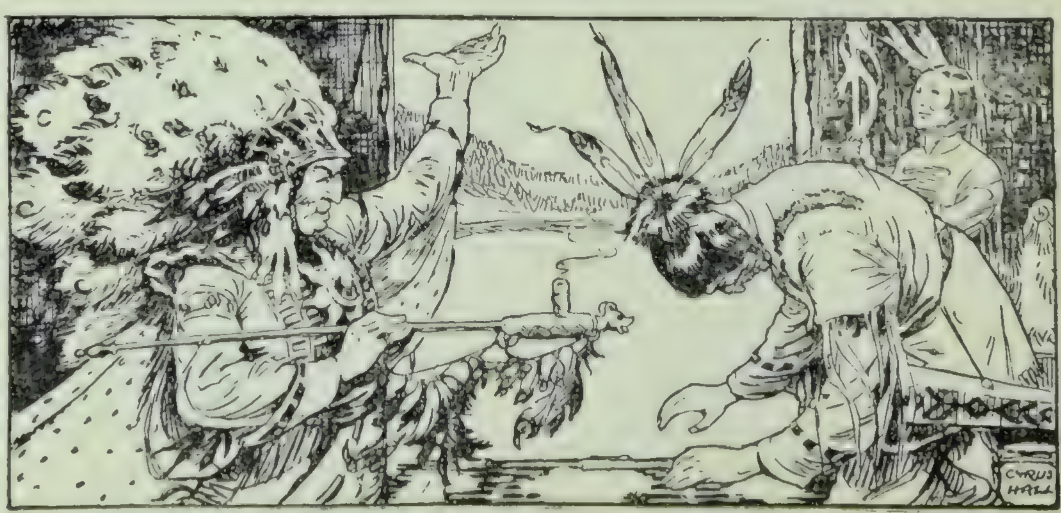
Now the Sun-God felt so thankful that he said to Scarface :

" You may ask any boon you wish. It will be granted."

Our hero told of his dearest wish, and the Sun-God said :

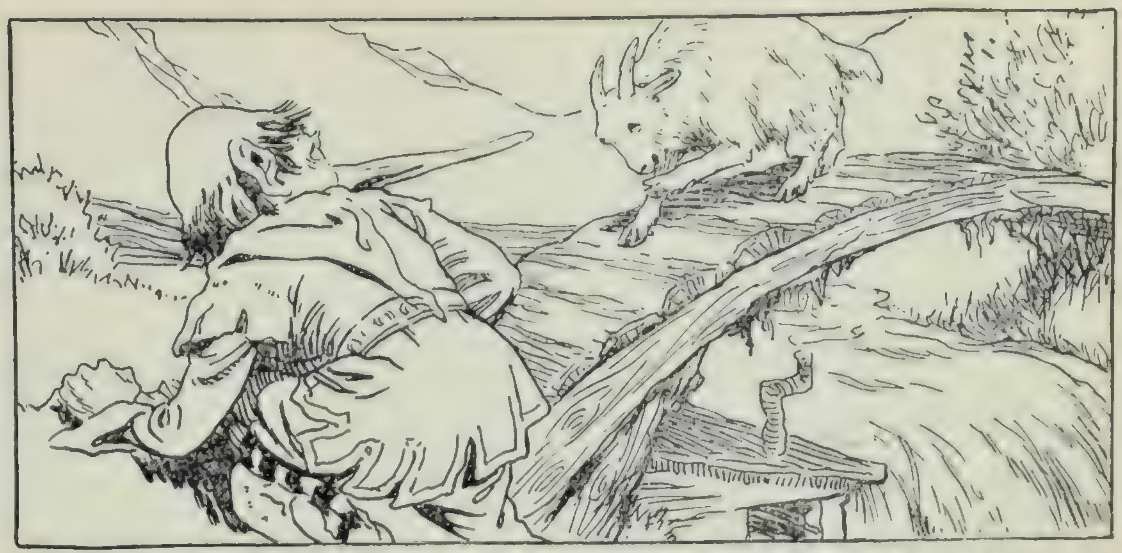
" Return, the maid shall be yours, for you are now worthy of her."

At that, the great, ugly scar fell from the face of the brave. He was ugly no longer. He returned to his lodge, married the Chief's daughter, and was no longer known as Scarface, but as Smoothface, little brother to the Sun !



" Ask any boon you wish," said the delighted Sun-God. "It will be granted."

THE THREE GOATS NAMED BRUSE



"Who goes there over my bridge ?" roared the wicked troll from below.

ONCE upon a time there were three goats, and all of them were named Bruse.

There was a little billy-goat Bruse, a middle-sized billy-goat Bruse, and a great big billy-goat Bruse.

Now they were all going off to the mountain-side to graze, so that they should all grow fat. But on their way they came to a waterfall, and over the waterfall there was a wooden bridge.

Few people were brave enough to pass this way, for under the bridge there lived a wicked troll. His eyes were as large as plates, and his nose was as long as a broom-stick !

" *I* am not afraid," said the little billy-goat Bruse.

" And *I* am not afraid," said the middle-sized billy-goat Bruse.

" And *I* am not afraid," said the great big billy-goat Bruse.

THE GREEDY TROLL DETERMINES TO MAKE A MEAL OF THE BILLY-GOAT.

Then they all three started to run across the wooden bridge. The little goat went first. The boards of the bridge creaked and groaned as he ran, trip, trap, trip, trap.

Out rushed the wicked troll.

" Who goes there so boldly over my bridge ? " he roared, coming up from below.

" It is I, the little billy-goat Bruse. I am off to the mountain-side to graze."

" Then I am coming to eat you up."

" Oh, no ! Do not trouble yourself about me. I am far too little. Wait until I am big and fat."

" Very well," said the troll, who was very greedy, and liked fat goats best. " I will wait, but do not be long."

" No ! no ! I will not be long ! " and the little billy-goat ran across to the other side.

HOW THE BILLY-GOAT HAD A FIERCE FIGHT WITH THE TROLL.

Next came the middle-sized billy-goat Bruse. He ran over the bridge. Trip ! Trap ! Trip ! Trap ! creaked the boards as he ran.

Again the troll rushed out.

" Who goes there so boldly over my bridge ? " he roared.

" It is I, the middle-sized billy-goat Bruse."

" Then I am coming to eat you up."

" Oh, no ! Do not trouble yourself about me. I am far too little. Wait until I am big and fat."

" Very well," said the troll. " But I am getting hungry. Do not keep me waiting long."

" No ! no ! I will not be long ! " and the middle-sized billy-goat Bruse ran across to the other side.

Then came the great big billy-goat Bruse.

As he ran, the boards of the bridge creaked more loudly than ever, for he was so heavy. TRIP ! TRAP ! TRIP ! TRAP !

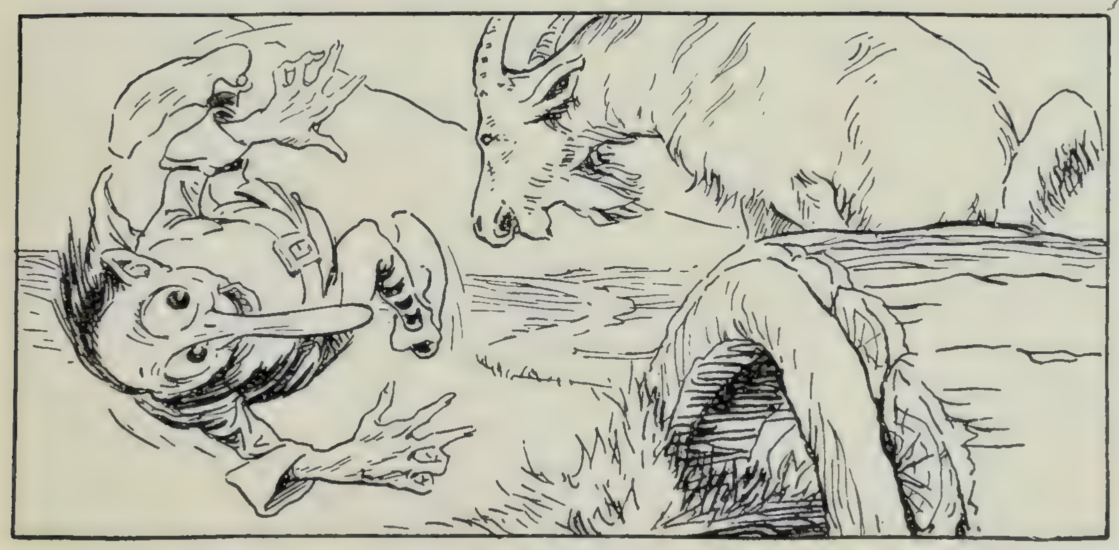
Out rushed the troll, for the third time.

" Who goes there so boldly over my bridge ? "

" It is I, the great big billy-goat Bruse," roared the goat in a terrible voice.

The troll thought he was the first goat who had now grown big and fat.

" Ho ! ho ! Yes, I think you will do. Now I am coming to eat you up ! "



He killed the wicked troll, and tossed him on his horns right into the waters below, and now the bridge is quite safe for any to cross.

But the big goat roared :

“ Come you, then. Two horns I bear,
With which you limb from limb I'll tear.”

Up came the troll, and such a fight followed that the bridge seemed as if it would give way. But the big billy-goat won. He killed the troll, and tossed him on his horns right into the waters below. Now the bridge was safe for others to pass across.

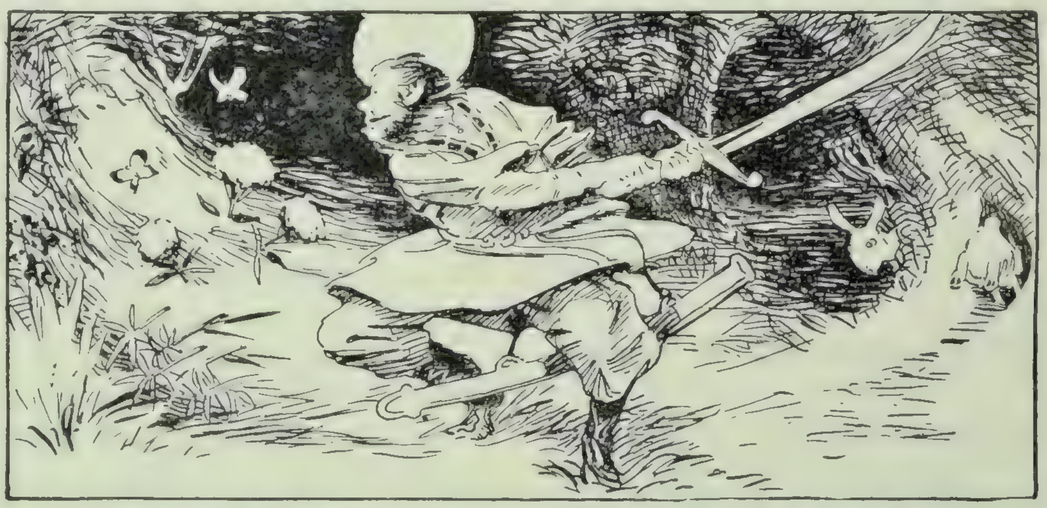
Snip, snap, snout,
Now my story is out.
Turn the page over,
You'll find another,
But not of the goats
And their GREAT BIG BROTHER !

NASNI AND THE GIANTS

ONCE there was a man called Nasni. He was a very timid man, but he liked to pretend to himself that he was brave.

He was always thinking of great deeds, but never did them. When no one was about he would pretend he was fighting giants and wild beasts, and would imagine he beat them every time.

So when he was out one day, he flung his sword here and there and imagined that he was killing giants. He killed three flies !



He imagined he was slaying giants, but he only killed three flies !

“ Well, they might have been giants, anyhow,” said Nasni, and he took his sword home with him, and engraved upon it these words :

“ Here is the sword of Nasni, who slew with it three giants.”

NASNI MEETS THE GIANTS AND SHOWS THEM HOW CLEVER HE IS.

Then he girded on his sword, took a bag of flour on his back, and went on a journey. He walked for many miles and became very tired. At last he came to a pear-tree. He lay down under the pear-tree, his sword beside him, and he fell asleep.

Soon there came along seven giants. They saw the sleeping Nasni and they read what was engraved upon his sword.

“ Here is the sword of Nasni, who slew with it three giants.”

They stared at the little man, and then at his blade, then back from the sword to the sleeping Nasni.

“ Ooh ! ” said one of the seven. “ Here lies a mighty enemy. Let us ask him to show us what he can do.”

Just as they said this, Nasni awoke. He was terrified at first at the sight of the seven giants. But when they came up to him, in a friendly manner, and asked him to show off his power, he said :

“ See ! This is the kind of man Nasni is.” And he stamped upon his bag of flour, which he had already hidden under the soil.

“ When I stamp with my foot, the dust rises in great clouds.” He went on stamping on the bag of flour, and soon the giants were half-hidden in the clouds of white dust.

THE GIANTS ADMIRE NASNI SO MUCH THAT THEY BEG HIM TO COME AND LIVE WITH THEM.

When the seven giants saw this, they were very much impressed. They begged him to come and live with them, and they gave him their sister for a wife.

One day, a big rhinoceros came into the wood where the giants lived. Now a rhinoceros is a huge ugly animal. Its hide is wrinkled and thick. On its nose it has a sharp, strong horn. This beast did much damage, so the giants set out to hunt him and kill him. They asked Nasni to come with them.

He was really much too timid to go, but he did not like to refuse.

“ I will follow in a few moments,” said Nasni, “ I must first sharpen my sword.”

But as soon as the giants had gone, Nasni ran up a tree to hide.

Presently, who should come by but the rhinoceros. It lay down under that tree and it would not move.

The giants were lying in ambush, watching to see what would happen. Poor Nasni fainted from sheer terror and down he fell on to the rhinoceros's back.

Up jumped the beast, and away he went at full speed. The jolting and the bumping brought Nasni to his senses, and he clung on with both hands to the creature's ears.

HOW THE SEVEN GIANTS MADE NASNI A GREAT HERO.

Hot on his heels came the seven giants. They shot the rhinoceros dead with their arrows. Nasni pretended to be very angry.

" Could you not see that I was beginning to tame it ? " he cried. " The beast might have been very useful to us."

The giants stared at the brave little man who had tried to tame a wild beast.

A little time later, a whole host of enemies came and marched against the seven giants.

" Come with us and help us to rout them," said the giants to Nasni.

Nasni was too timid to go, but he could not refuse.

He chose the quietest-looking horse he could find, and followed the giants.

But as soon as the horse heard the sounds of fighting, he was a changed creature. He was off like the wind.

Poor Nasni tried to cling on to a tree as he passed by, but the tree came up, roots and all, in his hands.

Away went Nasni on his horse into the thick of the fight. The tree that he carried scattered the enemy right and left.

When Nasni came back, the seven giants called him a great hero. They led him back to their camp with songs of praise and thanksgiving, and there he dwells even to this day !

BEADS FROM ODDS AND ENDS

Here is a little instruction for girls. Try your skill at bead making, using the materials that lie around you in the home. The results will surprise you.

WET days and winter evenings often become wearisome to the healthy girl, and indoor occupations are necessary to give interest. When the fingers are busy, and something is being made, there are no dull moments, and if that something can be made without the expenditure of money, then the hobby becomes more interesting still.

Beads offer a solution to the question, " What shall I do next ? " Home-made beads ? Made of what materials ? Listen. Beads can be made from the most unpromising material, and can be made to look very pretty, too. The following instructions and suggestions will give you many ideas, and after trying out the suggestions given, you will most probably think of other materials lying at hand in your home.

EVEN SEEDS AND STICKS OF MACARONI FORM MATERIAL FOR BEADS.

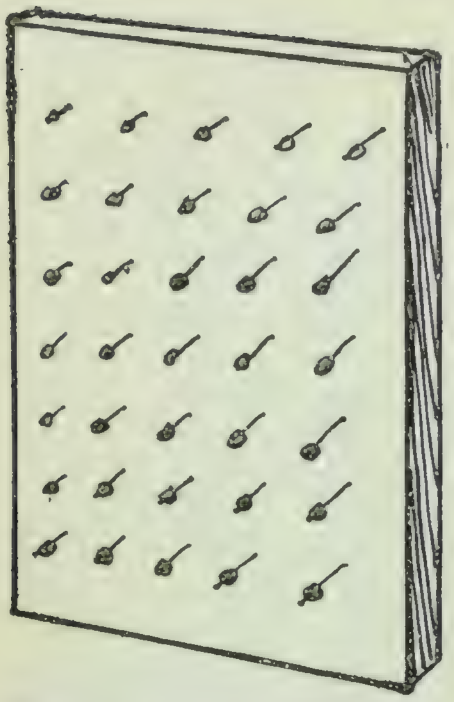
Make a custom of saving certain seeds taken from the fruit used in the household. Melons and oranges give seeds or pips exceedingly useful in bead work. The seeds should be laid out on a piece of blotting paper and dried slowly. They should not be put away in a box until absolutely dry. Again, small beans, the dried varieties bought at the grocers' shops, and also small peas are of value, as are sticks of macaroni and even pearl barley.

HINTS ON PIERCING THE BEADS, COLOURING AND VARNISHING THEM.

The chief task is that of making holes through the seeds without bursting them. If this proves difficult when dry, thread them on thin wire when straight from the fruit, and allow them to dry suspended. Beans and peas may be soaked a little before piercing, and allowed to dry threaded on the wire.

The colouring of these natural beads may be carried out with various colouring matters. Cellulose paint gives a smooth, enamel-like lustre, while lacquer and varnish paint are very successful. Water colour, varnished when dry, gives a mellow hue to the colours used, while ordinary dyes, as used for silks, cottons, etc., will give a brilliant colour, but will leave the surface of the bead unpolished.

The seeds should be held on a thin wire, one by one, and actually dipped into the colouring matter. They should then be hung on pins pushed through a piece of stiff card standing vertically, as in the sketch on the next page. If you wish to make a permanent drying-board, take a piece of thin board and drive into it a number of gramophone needles. Fine tone needles are best, as they are very thin. Pins should not be used unless the heads are previously nipped off by means of pliers. Just knock in the needles lightly or they may break. They will thus dry



Sketch showing method of hanging newly painted beads to dry.

without showing brush marks or blemishes where they have rested for support.

The macaroni may be cut into short pieces to make tubular beads, and these may be decorated with paint brush or pen and coloured inks. Spiral lines or designs may be drawn upon them, and the whole varnished over. The pearl barley is useful in the making of fancy beads. For instance, take a pea, and carefully stick round it, using a strong glue, say six or eight barley seeds. When they are firmly affixed and the glue is set, colour according to your fancy and quite a beautiful bead will result.

HOW LOVELY BEADS CAN BE MADE WITH WAX AND A KNITTING NEEDLE.

Glitterwax or playwax may be used for bead-making, the beads being modelled from the warm, soft wax, round a fine steel knitting needle, from which they may be pulled when set. Always immerse the needle and its beads in cold water, and leave for a minute or two, before attempting to slide them from the needle. Beads of beautiful colours may be made of wax, and blendings of colours may be practised by rolling two colours of wax into long lengths, twisting one round the other, and rolling the lot into a ball. This gives a pleasing marbled effect.

Sealing wax makes bright beads, and a good imitation of a coral necklet may be made with the ordinary red type of wax. Drop your hot wax on to a knitting needle, turning the needle round and round until the wax forms itself to the desired shape. A sharp pencil-point or a pen nib will assist you in placing a pattern on each bead if this be done just as the wax is beginning to harden. A little practice will teach you how to alter the shape of your beads by deft touches with pencil or pen, or with slight pinches here and there with the fingers.

WOULD YOU LIKE TO MAKE A BEAD CURTAIN ? THE INSTRUCTIONS ARE EASY TO FOLLOW.

Beads may also be made from paper, and after varnishing make especially useful beads for decorating bead curtains. Bead curtains generally consist of bamboo tubes of various lengths, threaded on long strings, and picked out here and there with glass beads.

Paper beads add to the gaiety of a bead curtain, and are both easily made and very durable. Cut some pieces of coloured paper (wall-paper is excellent, and silver paper backed with thin white paper is effective) of the shape shown in the accompanying drawing. Take a thin knitting needle and commencing at one end roll the paper tightly round it, gumming the other end firmly when the bead is complete. Remember to wrap the paper as tightly as possible, as the beads must be firm. Then slide off the bead and repeat the operation with the next piece of paper. The beads thus made should be varnished to protect them from damp. If the paper beads have been firmly made and well varnished they will keep their shape and beauty for many years as bead curtains, and will be both useful and ornamental.

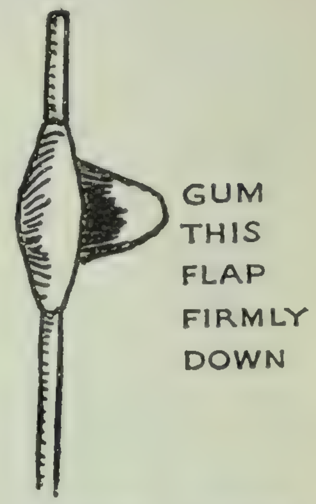
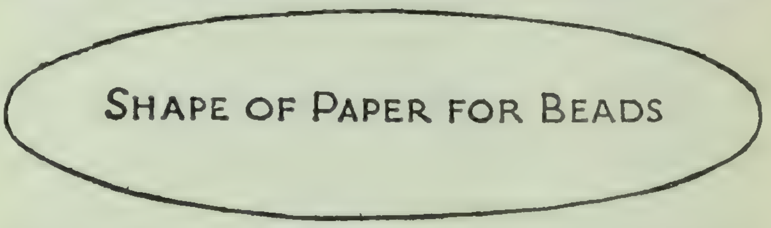


Diagram showing method of rolling paper beads on a knitting needle.



Clay beads may be made to look artistic if carefully modelled. The clay should be pure and free from grit. Do not be content merely to make round beads, but try square, oblong and fancy shapes. A sharpened pencil, or a knitting-needle, may be used as a modelling tool. The clay beads, on the frame, should then be allowed to dry before painting and varnishing.

The Musk-Ox, a clumsy animal with long, brown hair, has a thick layer of wool underneath that is shed in summer. [E.N.A

NATURE'S FORETHOUGHT

Every mother looks after her children with loving care, and does her best to make the battle of life easy for them. The greatest and busiest parent of all, old Mother Nature, shows the same tender care for her large family, and helps them in their struggle for existence. In many clever ways she protects them from their enemies, giving them weapons of defence, and changing their clothes to the same colour as their surroundings, so that they can escape notice. A fascinating story is unfolded below, telling how Nature performs this miracle on many of her children.

THE study of the way in which the creatures adapt themselves to their background or surroundings, or in a larger sense to the whole conditions of their lives, is a very fascinating one. We must remember that this process of adaptation is constantly going on. Every living creature is adjusting itself more or less successfully to its surroundings ; every least adjustment brings a corresponding change in the organism, and the effects of these changes can be inherited by the children.

When you realise this you will understand how the creature's reaction to its environment can produce a pair of antlers or a peacock's feather just as easily as it can produce the instinct for combat or display.

Some of Nature's adjustments in animals alter their behaviour in different surroundings. Other changes are those of structure—as in the case of horses, who, in far-off days when they lived on soft ground, had cloven hoofs.

In prehistoric times, when life was concentrated in forest-bound lakes and rivers, creatures were fitted for life in the water. Then when some of them made the great adventure of establishing themselves on land, Nature performed the slow but relentless miracle of changing their fins for limbs, with which they could walk, and their gills for lungs which enabled them to breathe in the ordinary atmosphere.

Then in a general way you may note that every animal has features which are specially adapted to its mode of life. The sabre-like horns of the Ibex, the close, "ramming" horns of the Musk Ox, the palm-like spread of the Elk's antlers—all have their especial fighting value to the animal concerned. Tails are very diverse, yet each is admirably suited to its purpose, from the powerful swimming tail of the Crocodile to the long, climbing tail of the Lemur. The Kangaroo, who ordinarily stands on his hind feet, can use his thick strong tail as a kind of "sportsman's seat" while he uses his feet as weapons !

If you could examine the upper and lower jaws of a Mediterranean fish named *Chrysophrys*, you would observe the teeth are all joined into powerful, crushing knobs to make the eating of shell-fish a simpler task. Similarly the teeth of the eagle ray, *Myliobatis,* form hard and smooth plates arranged as a miniature crushing-mill.

So it is with all the animal features. Necks long or short; hoofs solid or cloven, flat or concave; teeth and claws for the rending lion and long sticky tongue for the ant-eater. Nature by her own wise method has apportioned them all.

HOW SHIPS WERE CAMOUFLAGED TO KEEP THE ENEMY AWAY.

During the Great War ships were often saved from attack by enemy submarines by camouflaging, or, in other words, disguising themselves.

In winter the Arctic Fox changes into a white coat so that it can prowl unnoticed among the snow. It is sought after by trappers for its fur, which is very valuable, but Nature has given it a chance of escaping from its enemies.

In dock they looked as though they had just been painted in the latest jazz style, but out on the sunlit open sea the vivid coloured stripes and bars seemed to cut across the true shape of the vessel and take one's eye from its real outline.

Something of the same kind goes on in the animal world. Either in defence or for aggression many animals acquire the form or tint of some part of their background. Thus a beautiful Indian butterfly by folding his wings becomes merely a dead leaf clinging to a twig. Stick-caterpillars, too, only move in search of food at night-time, having held themselves rigid all day in amazing similarity to a twig—complete with buds! The South American Nightjar displays commendable calmness in the way it nests on exposed tree-stumps or fence-posts. For hours on end it sits bolt upright with its head pointing straight into the air. Yet you have to look exceptionally closely to distinguish it from a piece of dead wood, for its coloration matches its home as neatly as its posture!

In most aquariums you will find a large tank divided by a communicating door. In one compartment the floor is of fine sand and in the other of boldly-variegated shingle. Closely watch a flounder as it passes from one portion of the tank to the other. It takes it less than five minutes to change the suit of dark-brown, sandy-yellow and pale-cream blotches which it wore in the shingly compartment to one of a fine-grained pattern, which blends beautifully with the background of sand.

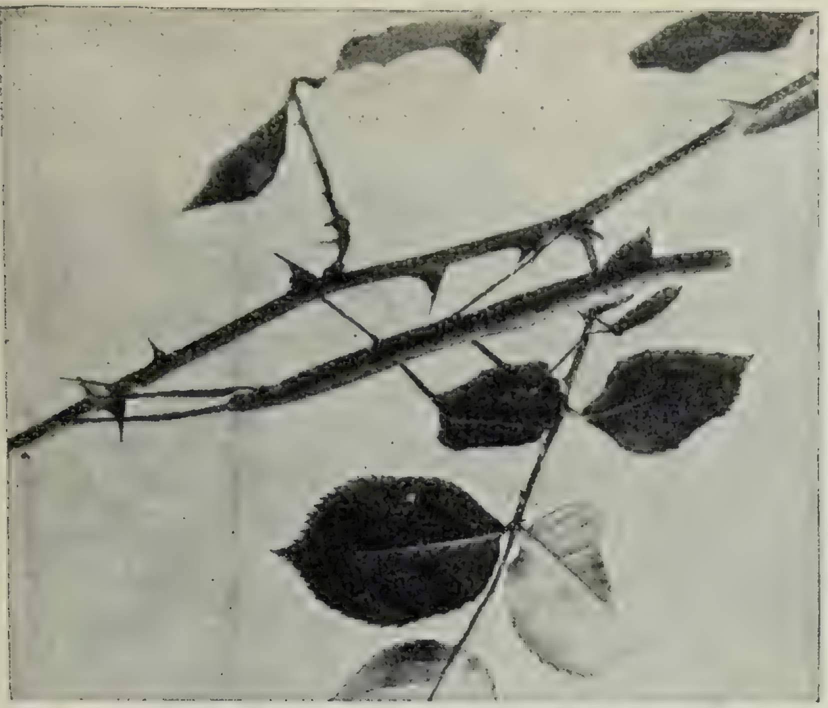
The tiger and the zebra match the striped shade of the grassy jungle where they dwell—the zebra so that he may graze unseen, the tiger so that he may remain invisible while he stalks the zebra.

HOW SOME ANIMALS PUT ON THEIR NEW WINTER GARMENTS.

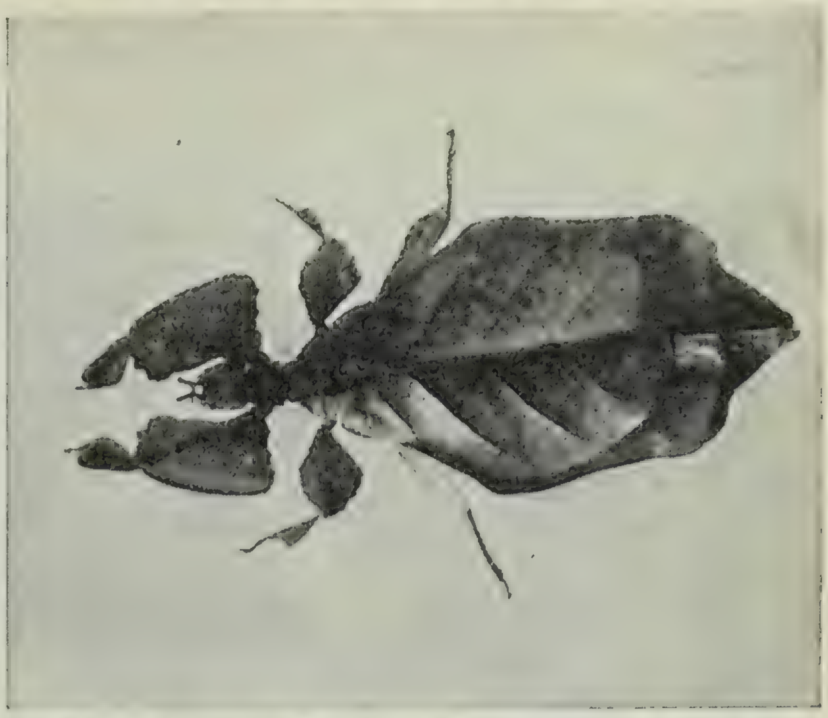
Then there is the case of the creatures who change their coats in winter—the Arctic Fox, the Ermine, the Ptarmigan, the Mountain Hare. These assume the colouring of the snow among which they dwell. Not that they actually "cast" their coats like some of the cattle tribe, or even change the pigment. The hairs, like the froth on a dark liquid, become white through the presence within them of gas or air.

Nature profitably exploits the artists' principles of shading. Just as a painter shades the underside of an object to appear as though it were a shadow thrown by a solid figure, so

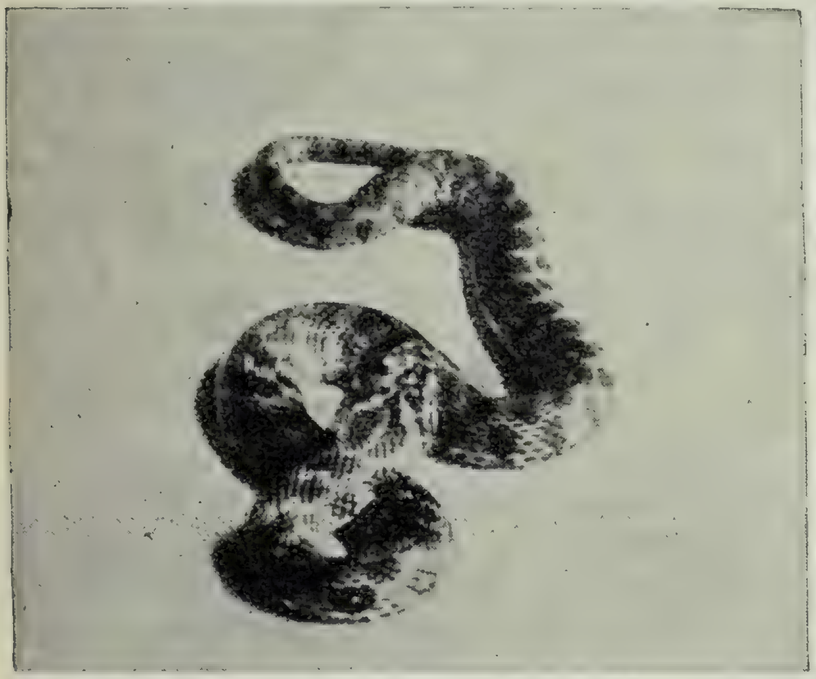
HOW NATURE PROTECTS HER CHILDREN



The stick insect is cleverly protected by Nature. It is so difficult to distinguish from the branches on which it rests that it can hide safely from its enemies.

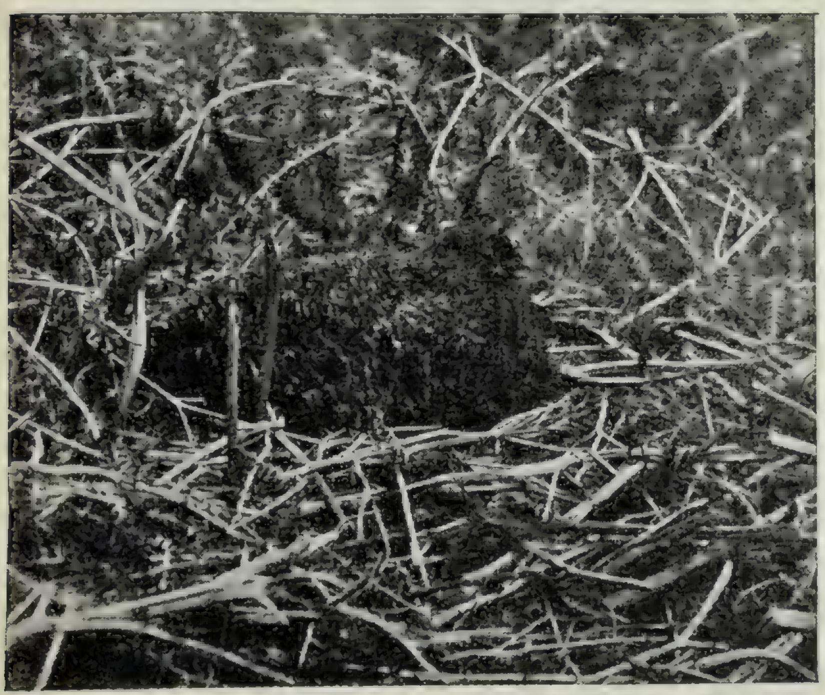


Leaf insects mimic their usual hiding-place so that they, too, will be safe from their enemies. The body is large and flat, and the legs resemble small leaves, moss, or sticks.

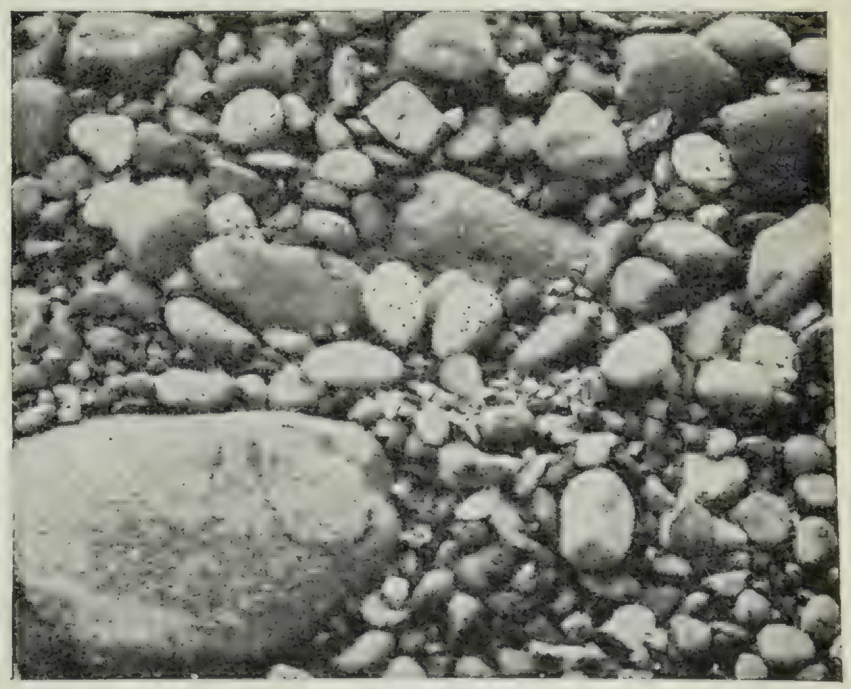


Nature has given this harmless, viperine snake a skin like that of the poisonous viper. Its warning colours keep away enemies that would otherwise attack it.

As this snake feeds on eggs, it has developed an egg-opener in place of its teeth. In this way Nature has made it easy for it to make a meal of large eggs.



The Red Grouse, found only in the British Isles, finds its colouring useful when it wishes to hide among the bracken, during the shooting season, when it is greatly in demand.



The Little Tern, a long-winged British sea-bird, leaves its spotted eggs on the beach, where they lie quite safe and unnoticed among the pebbles which they resemble.

The Giraffe has been provided with a conveniently long neck so that it can reach its food high up among the branches.

Nature's camouflaging department harnesess the reverse theory. In the London Natural History Museum is the model of a duck against a background of light brown. Although the duck is dark brown on the upper half and white below, it blends beautifully with the backcloth. You have only to turn it upside down to see how vividly it would stand out if the positions of the colours were reversed. In the same way, any fisherman will tell you how a dab or a plaice is almost invisible when swimming normally, but the moment it turns over on its back it becomes instantly conspicuous.

HOW SOME CREATURES SEND FORTH A DANGER SIGNAL TO WARN OTHERS.

A reverse principle is illustrated by the woodcock. Bars and patches of yellow and brown break up the outline of the bird into irregular and puzzling pieces. Unless you are at very close quarters its actual brightness makes it difficult to distinguish. This is known as ruptive coloration and is the principle behind those gaudily-camouflaged warships which first led us to discuss this topic.

There is another form of colour adaptation called " warning " coloration. It is generally adopted by creatures who have no need to hide, because they are not good to eat—creatures who are either nauseous or definitely poisonous or harmful. A familiar example is the wasp, whose yellow and black abdomen is a warning notice saying " Keep off ! "

The nature and location of the food supply is an important factor in the environment of any creature. As we have seen in the case of the Giraffe, if the food supply be high up among the trees the creature will gradually elongate legs, neck and tongue in order to reach it. Grass-eating animals may have much shorter legs and short, thick necks like the Buffalo.

WHY SOME ANIMALS SPEND THE WINTER SLEEPING.

In the case of the Carnivora, or flesh-eaters, every feature is designed to help them to catch and kill their prey. Desert animals, like the camel, who have to take their meals at long intervals, are provided with storing capacity for food and water. Others practise seasonal migration in search of food. Creatures who live in regions foodless in winter are furnished with the hibernating (winter-sleeping) instinct, while some who live in droughty lands have the instinct to æstivate, or sleep in summer.

Warmth and air are as necessary to most animals as food and water, and the means evolved to procure them are as diverse and wonderful as any of Nature's expedients. For a striking example of Nature's elastic powers of adaptation you have only to turn to the common frog, which has the remarkable power of being able to live in water, on land or beneath it ! In the early part of the year the frog dwells in his pond-home. But with the arrival of summer he finds his food on the shore. Now Mr. Frog, like many of us, does not relish the coldness of winter, so he promptly dives to the bottom of his pool and there buries himself until the following spring. Thus has Nature fitted him for the various stages in his annual life.

Even among the higher animals there are differences of structure. The big swollen nose of the Saiga (a kind of antelope of the Kirghiz Steppes) is believed to be an adaptation to the rarefied air of the high altitude at which the animal dwells.

THE ANIMAL THAT KEEPS HER CHILDREN IN HER SOFT, FURRY POCKET.

Then, of course, " clothes " are changed—warmer coats are put on for the winter. A great many cold-country creatures grow longer and thicker coats in winter, and these in summer are " cast "—a very ragged-looking process! The white fur of the Arctic animals, too, besides being a concealing device, is the best means of conserving warmth in the cold regions.

Many of the animals are more concerned for their babies than for themselves, and if there is one thing the little creatures need more than another it is warmth. So the birds have downy plumes with which to hatch their fledglings; and even the fearsome Alligator lays her eggs on vegetable mounds where the heat of fermentation helps them to hatch out. Then the Kangaroo has a soft furry pocket into which she slips her very helpless babies to keep them warm.

We have seen how some of the larger animals adapt themselves to their surroundings. Let us look at another big fellow, the camel. He is a miracle of nice adjustment. His most prominent feature, his hump, is simply a store of fat which he lays up in anticipation of his long, foodless journeyings through the desert.

Similarly he is equipped with features necessary for the almost waterless region in which he lives. If your father were going on a long motor journey where the roads were without petrol pumps he would be sure he had a large petrol tank well filled with fuel. The camel, too, has its " petrol tank "—only in this case it carries precious water instead of spirit! Two of its three stomachs are little more than water carriers, lined with large cells. Muscles control these cells, directing the flow of moisture to the thirsty stomach.

THE DESERT DWELLER THAT IS A VALUABLE BEAST OF BURDEN.

His other features are no less fitted for their various tasks. His legs are long, for he has wide spaces to traverse; his neck is long, or he would not be able to reach down to crop the sparse herbage. He can close his nostrils

The long-legged monarch of the desert believes in the Scouts' motto, " Be Prepared." His hump and his three stomachs act as cupboards where he stores food and drink to use upon his long treks through the barren desert.
[*Sir J. B. Stone in Birmingham Reference Library*

at will against the terrible sandstorms which sweep over the desert; and a glance at his hoofs shows that these also are specially adapted to desert travelling. They are large and spongy and spread out when he walks to prevent him from sinking in the sand.

Though he is scornful and bad-tempered, he is a valuable beast of burden because of his wonderful staying-power and ability to go so long without food and drink. For thousands of years the "Ship of the Desert" has carried man across those uncharted seas of sand.

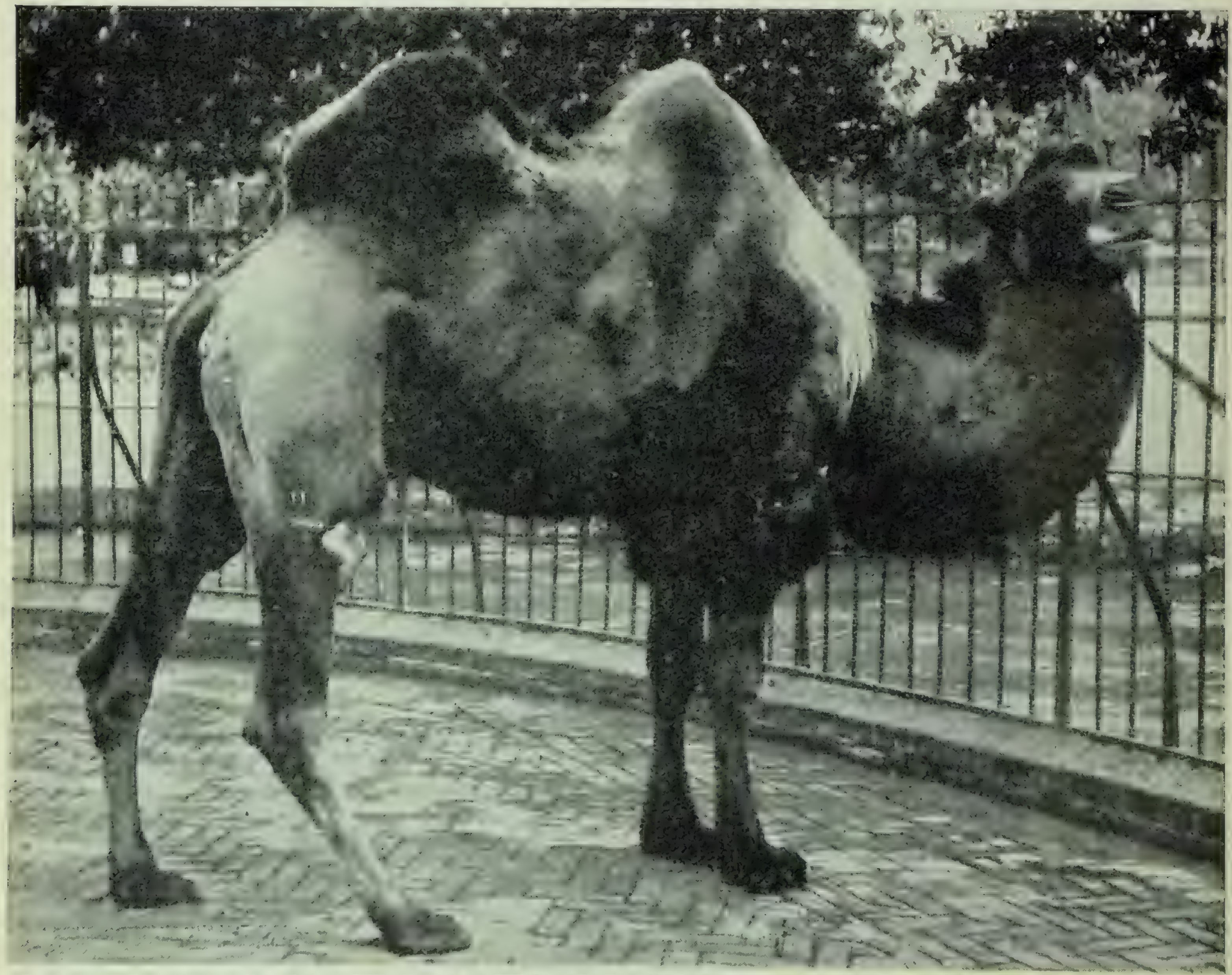
IN WHAT WAY DOES THE DROMEDARY DIFFER FROM THE CAMEL?

The Bactrian Camel, wrongly called the Dromedary, has two humps, and is quite as useful in the arid regions as his one-humped cousin. In winter he adapts himself to the colder climate of Mongolia and Turkistan—where he is found wild as well as tame—by wearing a thick shaggy coat which he discards untidily as summer draws near. The name "Dromedary" is properly applied only to the swift riding camel, whether Arabian or Bactrian, while "Camel" is reserved for the slower and clumsier beast of burden.

THE LITTLE LIZARD THAT CAN DISAPPEAR AS THOUGH BY MAGIC.

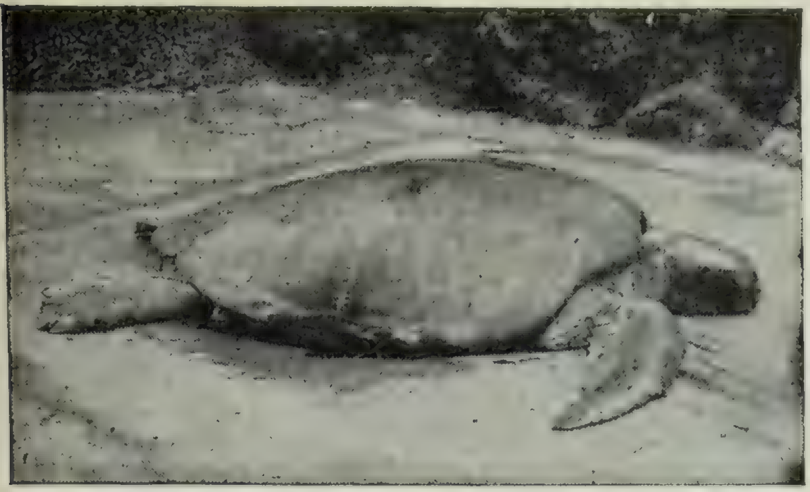
Reptiles, like insects, are past masters of the art of adaptation, particularly as regards colouring. The Sand Lizard of the desert is sand-coloured. The rock dweller takes on the tints of his surroundings. We have seen how the Iguana of the volcanic Galapagos matches the black lava rocks of his home. Others, like the little Asian Flying Lizard, can "disappear" into their background by a simple change of posture.

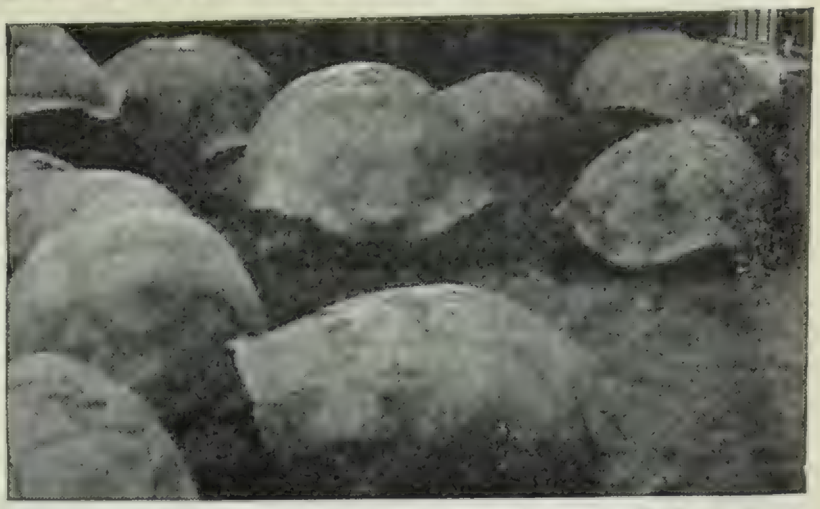
Take, for example, the sluggish little lizard whose name is spelt Chameleon and pronounced Kameeleon. It would soon be at the mercy of its enemies but for an amazing ability to change its colour according to the demands of the surroundings. With one background it may appear brilliant green while with another



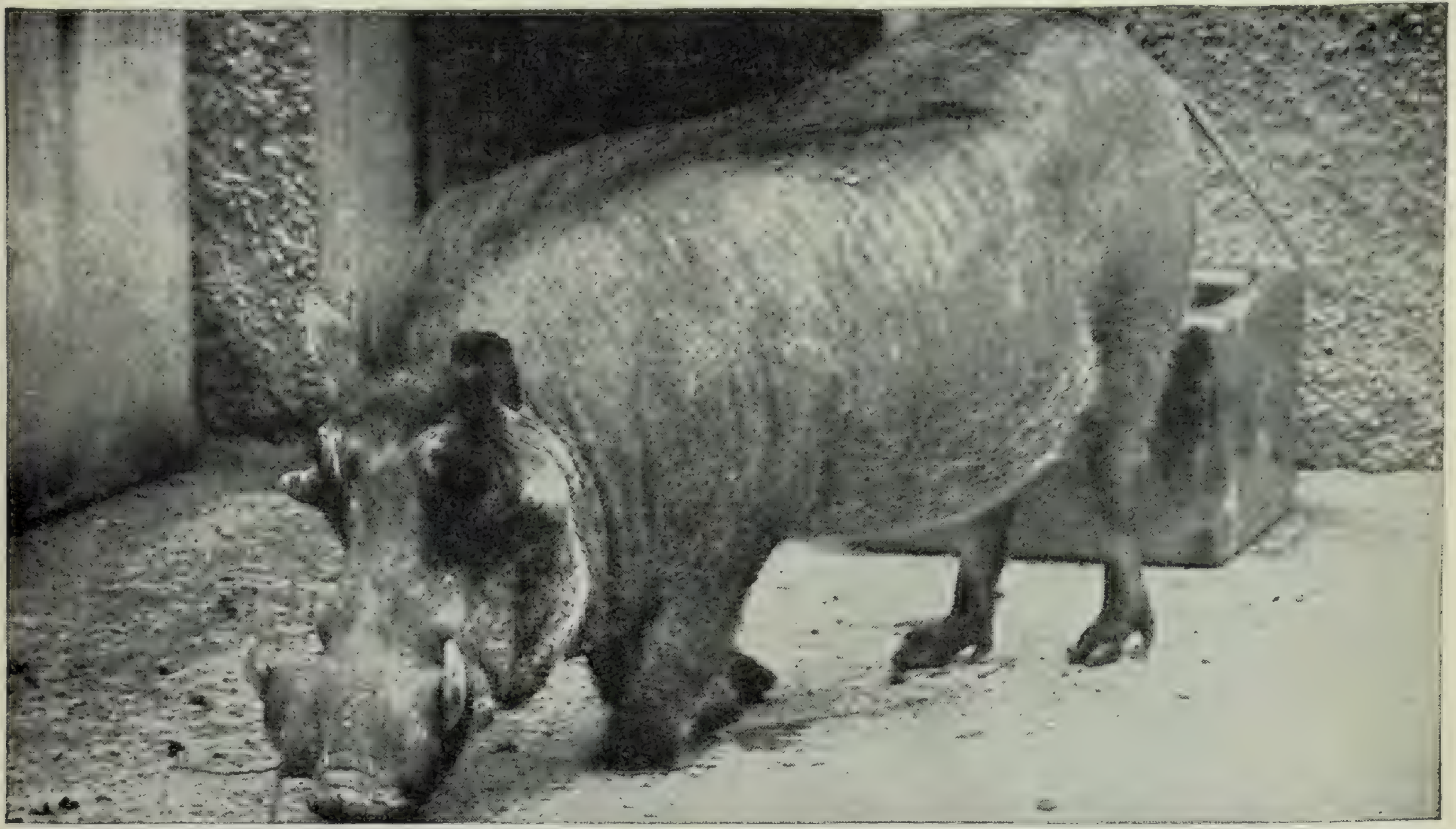
The Camel, with his two large humps, is a clumsier animal than his cousin, the Dromedary. He, too, is useful as a beast of burden, and can go a long time without food, and can adapt himself to cold climates. In summer he discards the thick coat that protects him in colder weather and looks very shaggy and untidy in the process.

WELL-ARMED MEMBERS OF THE ANIMAL WORLD

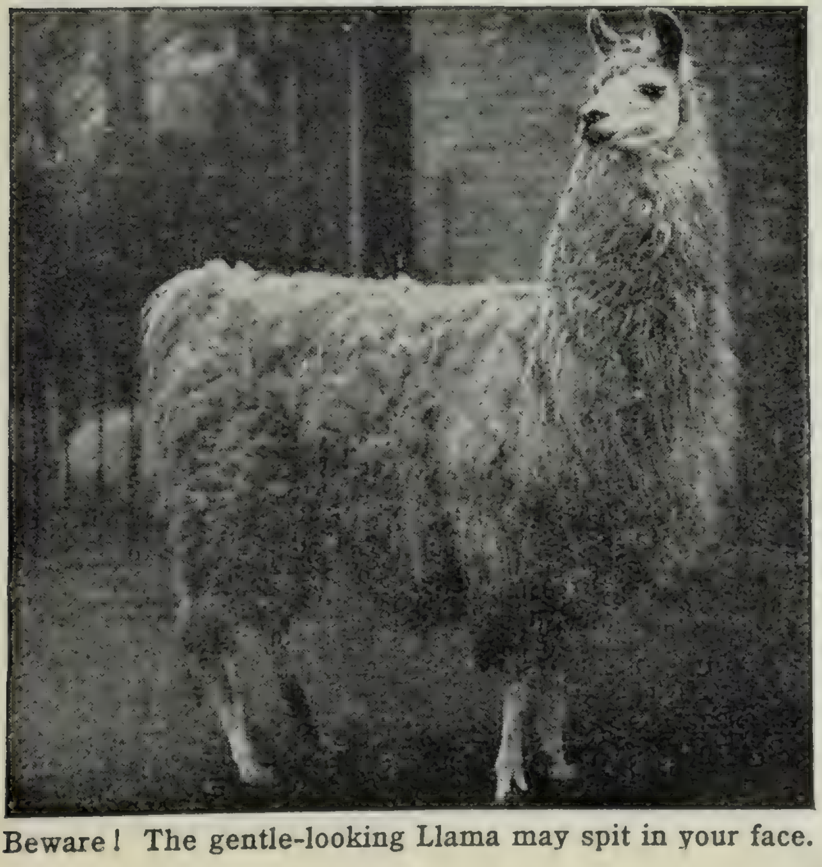




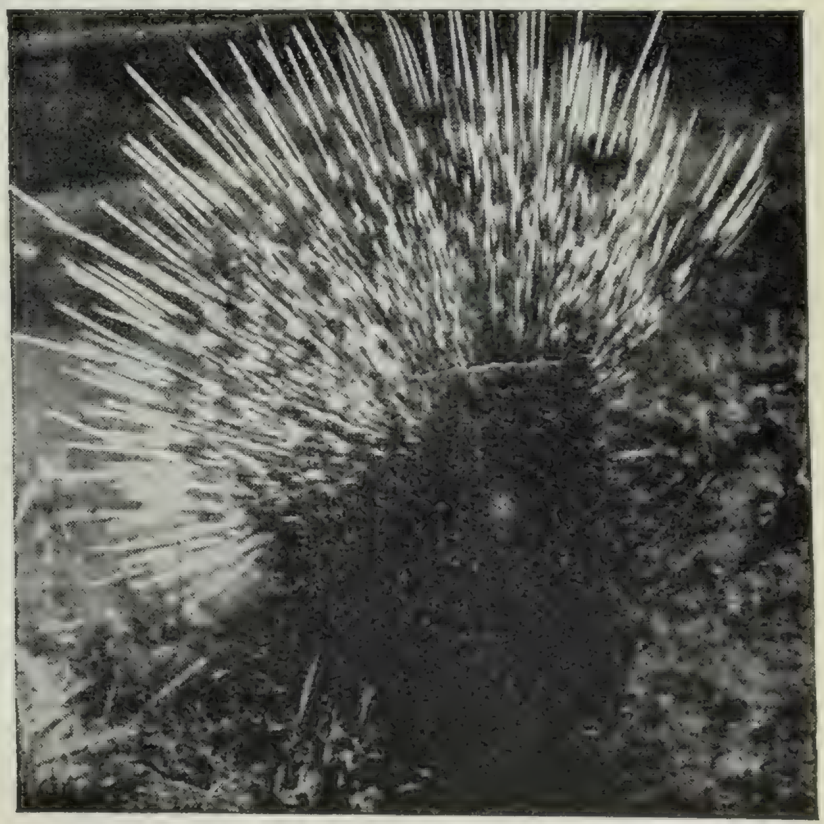
Inside their thick shelly coat, or carapace, the Turtles and Tortoises feel quite safe and secure from all their foes.



The ugly Wart Hog of Africa has tusks which sometimes grow right round his nose, like two great rings of ivory.



Beware! The gentle-looking Llama may spit in your face.



The giant Porcupine makes a great show of his defences.

This queer creature is the Chameleon, who changes his colour to suit that of his surroundings. [*F. W. Bond*

it is gray-black or chestnut-coloured, or even dotted with yellow spots.

How is it done ?

Beneath their transparent skins are layers of differently tinted cells, all under immediate control of the central nervous system. By contraction or expansion these changes in coloration are easily produced, and the Chameleon is thus able to match itself to the colour scheme of its surroundings and thereby remain concealed from its foes.

The Chameleon not only reacts to his environment, but to changes in temperature and even in the degree of light, while if you make him really angry he excels himself !

A few lizards, including the so-called Glass Snake of Southern Europe, will leave their tails behind them if they are grasped, and grow new ones—surely the height of adaptability !

By going to the insect world one could multiply examples indefinitely. Let us take one, because it is so perfect an adaptation as to be really startling. This is the Lantern Fly of tropical South America. His characteristic feature is a sort of carnival mask, which is an exact replica of an alligator's head ! The eyes are there, the nostrils, the teeth in long white rows. In shape and colour the resemblance is complete. What is the reason for this curious disguise ? Naturalists believe it is designed to frighten the monkeys and other creatures who prey upon the Lantern Fly, and who are themselves the frequent prey of the alligator. The sight of this portrait miniature must be very alarming ! Perhaps for a moment the sense of proportion is lost, and the head of the insect looms large as the head of the monster !

The poisonous Scorpion shelters her brood on her back.

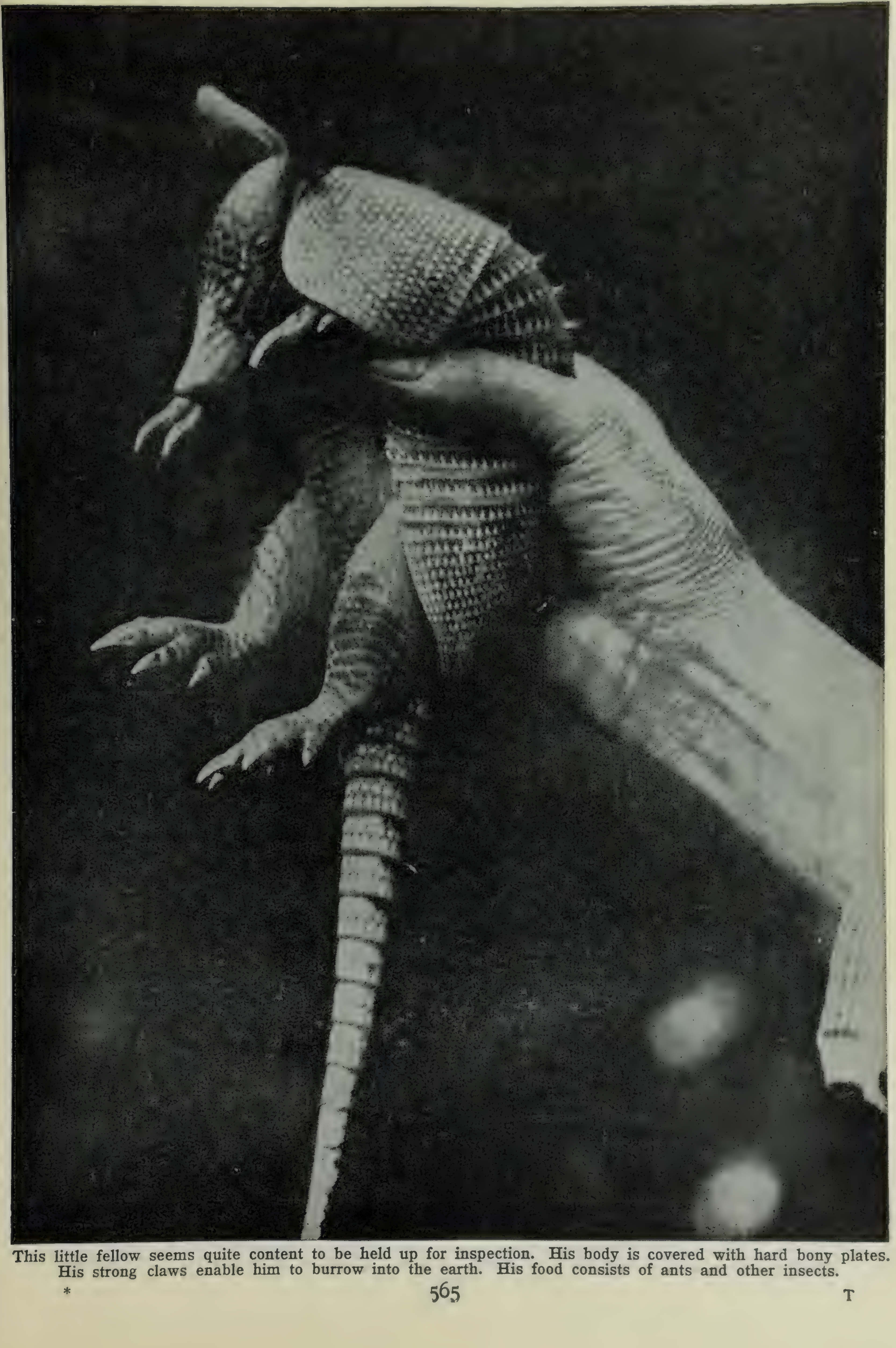
One of the most obvious ways in which Nature adapts her children is by giving them suitable defensive weapons. These may take any of a hundred different forms—teeth or tusks, horns, hoofs, tentacles, poison, pincers or an unpalatable flavour. The Wart Hog has a double set of tusks growing upwards in a semi-circle to meet above his nose. The tusks of the Walrus are thick and heavy. The Narwhal, or Sea Unicorn, has one straight spiral horn which gives him his name.

The hairy Porcupine, a prickly member of the rodent tribe, is ready to defend itself against all comers.

The Snakes and Scorpions are the chief poisoners. Generally, they give notice of their presence, the Rattlesnake, for instance, by shaking his rattle, and many more by their warning colouring of red-and-black or red-and-yellow. The Llama, though he looks tractable enough and is useful in many ways, has an unmannerly habit of spitting in the face of anyone who annoys him. The Electric Rays, or Marine Torpedoes, can kill their victims with a powerful electric shock.

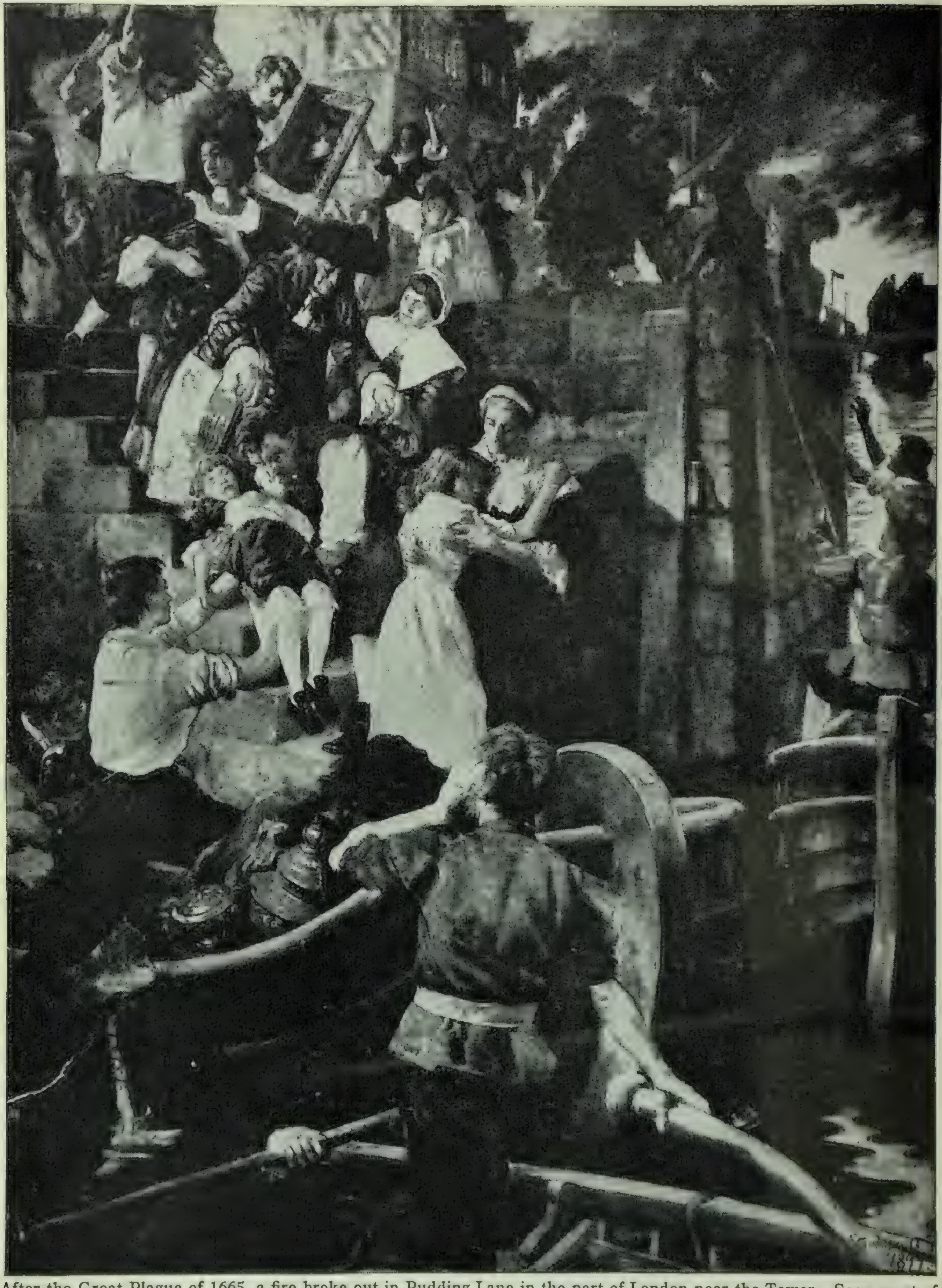
Other animals have solid shells, like the Turtles and Tortoises, or thick, tough skins, like the Rhino. Perhaps the most completely mailed of all the creatures is the Armadillo, who is covered with hard bony plates from his head to the tip of his long, poker-like tail.

A HANDFUL OF ARMOUR-PLATED ARMADILLO

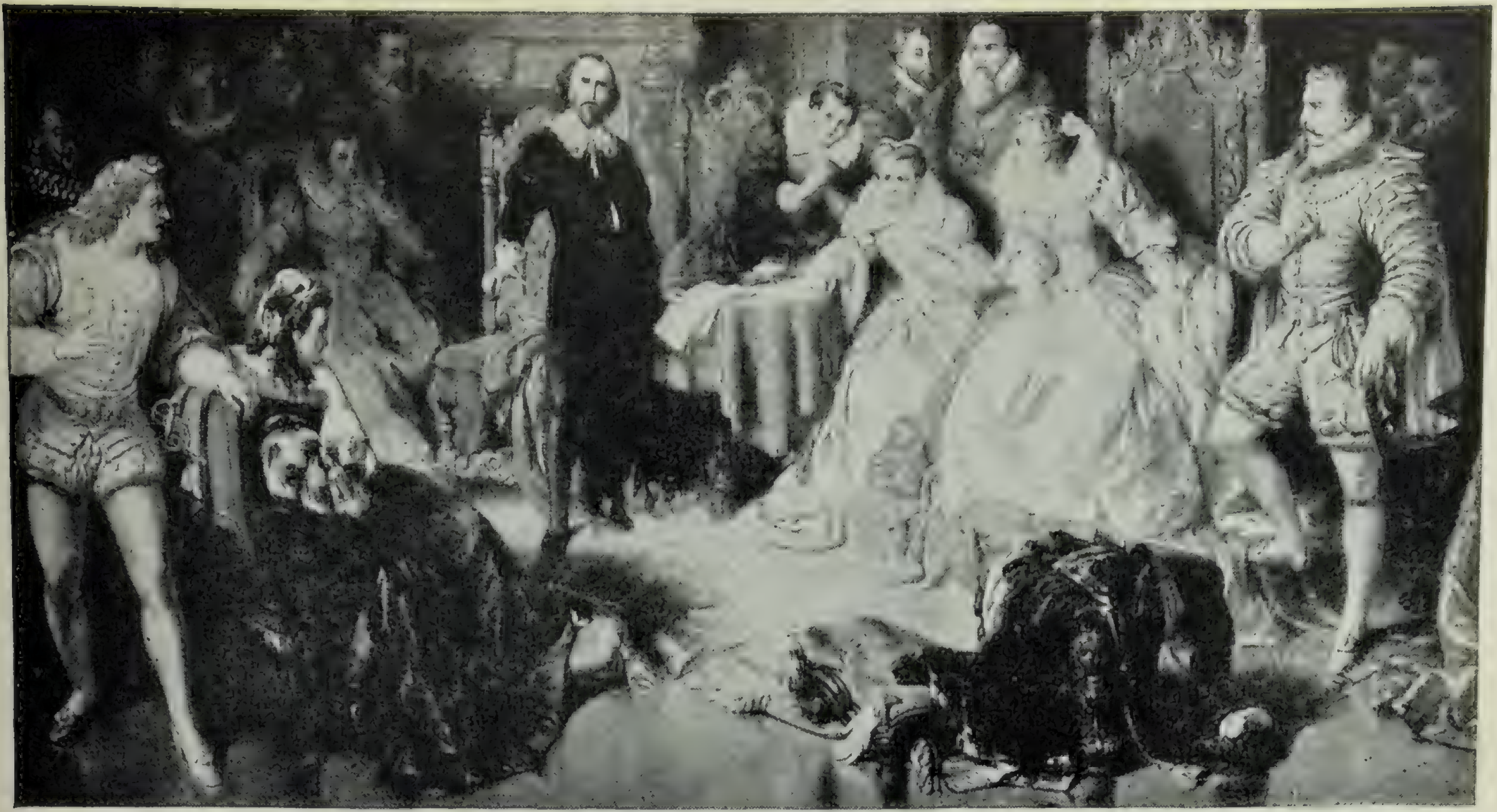


This little fellow seems quite content to be held up for inspection. His body is covered with hard bony plates. His strong claws enable him to burrow into the earth. His food consists of ants and other insects.

WHEN LONDON WAS DESTROYED BY FIRE



After the Great Plague of 1665, a fire broke out in Pudding Lane in the part of London near the Tower. Soon most of the wooden houses of the city were burning. Samuel Pepys describes in his diary what he saw in the streets during the Great Fire. A good book dealing with the plague and fire is Harrison Ainsworth's *Old St. Paul's*. The above picture, by Stanhope Forbes, shows people fleeing to the river with their belongings to avoid destruction.



Queen Elizabeth and her court listen enthralled to Shakespeare, who is reading his play, *Macbeth*, which still holds audiences entranced to-day. Note how absorbed the Queen and her courtiers are in the dramatist's story.

THE JOY OF READING

By STEPHEN SOUTHWOLD

You have most probably enjoyed some of Stephen Southwold's wonderful stories. Here this famous writer gives you some valuable advice on reading. He urges you to read with understanding, and to dig for the treasures that lie waiting for you in good books. The best of all treasures are those that are hidden away. You must read and at the same time think.

I WANT you for one moment to imagine an impossible thing: that you have been the only human being born into this world and that, except for the beasts, birds and insects, you are alone, without even a mother! Then let us suppose you lived to be a hundred in this strange world without other human beings, without cities or towns or villages, without trains or cars or ships or aeroplanes, without, in fact, a single thing that you had not made yourself. Can you see yourself, that solitary being alone in the world? Very well; now ask yourself how much do you think, by the time you reached your hundredth year, you would have learned about this vast world, its seas and oceans and continents; how much about the air you breathed, the water you drank, the food you ate; how much about the sun that blazed down upon you by day and the night-sky with its moon and stars up to which you stared wonderingly at night; how much about the beasts and birds and insects who were your only companions; how much even about yourself, your own body and mind? Would it have been very much, do you think?

Now I want you to imagine something else, almost equally as impossible. How old are you now? Ten? Twelve? Fourteen? All right; let us go back to the time when you were a tiny child of three, before you could read or write. Are you back there? Good. Now suppose everyone else in the world at that time had suddenly died, leaving you the only person on the earth, the earth with its cities and towns, its ships and aeroplanes, its wharves and quays, its factories and warehouses, its churches, schools and libraries, its theatres, picture-houses and art-galleries, and all the rest of the things that are part of the lives of civilised people. Suppose once more you lived to be a hundred. How much, even with all these wonderful things about you, do you think you would have learned, not only about them but about everything else in life? Unable to read and with no one to answer your questions, how much, do you think?

I have asked you to imagine these two impossible things because sooner or later you are bound to hear someone say, " Oh, books, yes, they're all right, but they're really only makeshifts; the only thing that can teach one anything is life itself, experience." That, of course, is nonsense. Like most nonsense it has a grain of truth in it, but it is only a grain. What that grain of truth is you can discover for yourself.

Stephen Southwold.
[*Pearl Freeman*

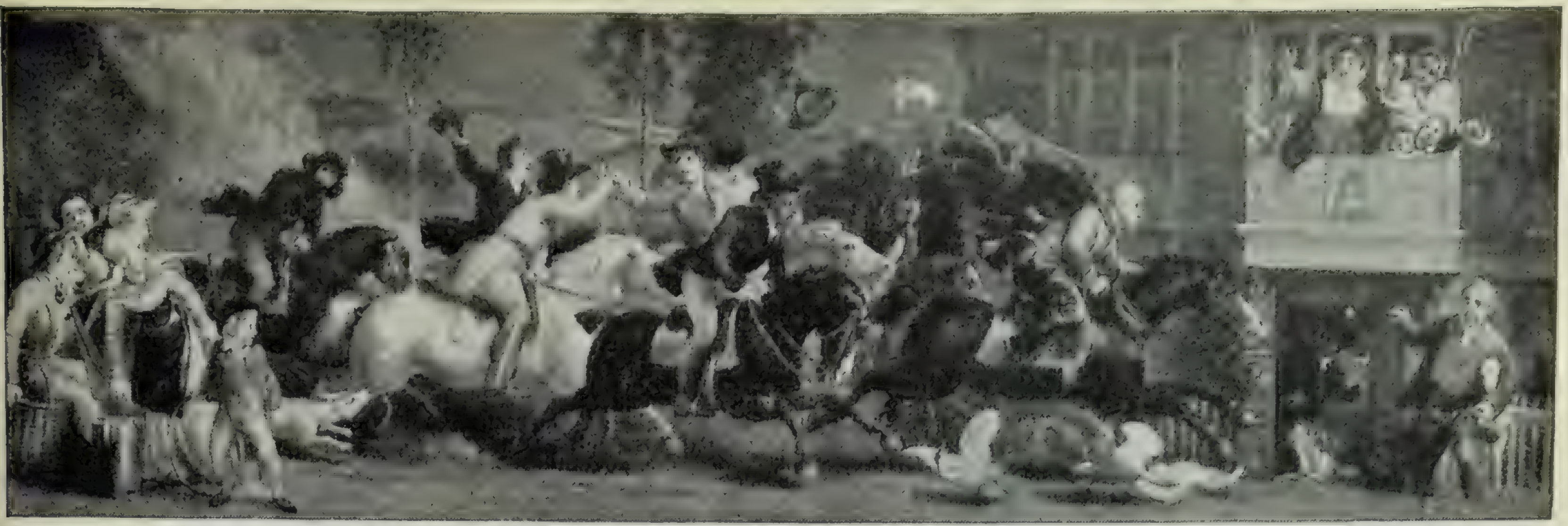
The books of the world contain the thoughts, the feelings, the joys, the sorrows, the wisdom and the discoveries of many of the greatest men and women of the human race, and all this is yours if you care to take it. Do you think any one person, however wise, however great, could possess in his own mind all these treasures? discover all these things for himself? The poet John Milton wrote: *A good book is the precious life-blood of a master spirit embalmed and treasured upon purpose to a life beyond life.* It is a treasury which can never be exhausted and will last as long as people have need of it or cherish it.

And what, you may ask, is a good book? That is not an easy question and it is one about which we must be careful not to be dogmatic or pretentious. But it is safe to say that a good book is one that lives on year after year, generation after generation. If a book has been read by people for a hundred years you may be quite sure it contains treasure. You will not have to make up your mind about that; you may take it for granted. This does not mean that new books, books written to-day, do not contain treasure; they may, but only time and you and I and all other ordinary people can help to decide that: and *you* must judge for yourself.

Humbug is a queer word. Snobbery is another one. You know what they mean. Bear them in mind for a few moments. It is so easy to be a humbug about books and reading and so easy to be a snob about them. We all are to some extent: try to keep that extent very small. It is humbug to pretend about books; to pretend you like a book because others like it; to pretend you think Shakespeare a great poet when you've only read a little of him and that little have found dull; to pretend, in fact, any single thing about a book or books that you don't sincerely feel. And it is just as much snobbery to say " Books? Pooh! *I* never read; I want first-hand experience," as it is to boast about all the great books you have read.

But there are other things in life besides learning, knowledge, wisdom. All normal people need and desire interest, amusement, excitement, joy, laughter, romance, beauty. Life certainly will give to every one of us a measure of all these things; how large that measure is will depend chiefly upon ourselves. But however large that measure may be it is but a teacupful to the ocean compared with the vast measure of all these desired things that books are waiting to pour out for us; that measure is, indeed, like the widow's cruse of the Bible story or the inexhaustible pitcher of the old myth or the barrel that was always full in the fairy-tale.

Most treasure is buried and one has to dig for it, and digging entails labour. This is often true of books. I said just now that it is humbug to pretend you like a book because others do. That is true: if you find a book dull and tedious, confess it. But you must bear in mind that if you find a good book dull, a book that thousands of people over many years have found absorbing, amusing, moving, interesting or exciting, then the lack is in you and not in the book. You have read it carelessly, perfunctorily, inattentively, with just the surface



Away went Gilpin! If you have read the dashing poem by William Cowper, telling of John Gilpin's mishaps, you will enjoy this picture. Note the look of surprise and terror on Gilpin's face, and the excitement of the onlookers.

of your mind, and so have missed its treasure. If you really want to find that treasure which others have plainly found, the only thing to do is to dig again. Often enough the treasure which needs the most digging for is the most worth while when you reach it. But you may fail to discover the treasure even after a second or third digging. All right; go and dig elsewhere. All people are not alike and there are many books which contain treasure for some but not for others, and there are so many books in the world packed with treasure that it is foolish to keep digging away at one simply because you've been told you ought to find treasure there and that others *have* found it. Leave it for a while and try another. If you return to it after a few years you may be luckier.

Is it worth the trouble? All this digging away for treasure, for beauty and all the rest of it? *What you've never had you never miss.* You've heard people say that often enough. Don't believe it; it is bunkum. Do you think a man born blind never misses all the things that sight gives to others? All the things he hears them talking about with so much interest and joy and excitement? You have five senses and a brain (or, if you prefer another word, an intelligence) to rule them. You will find you will be happiest when you are getting the utmost possible out of all those senses and out of that intelligence.

To what does all this boil down? Can we put it all into two or three sentences? Into *one* sentence? Extract the essence of it? Won't it come simply to this: *Books are mankind's rich treasuries whose gold all mankind may share.*

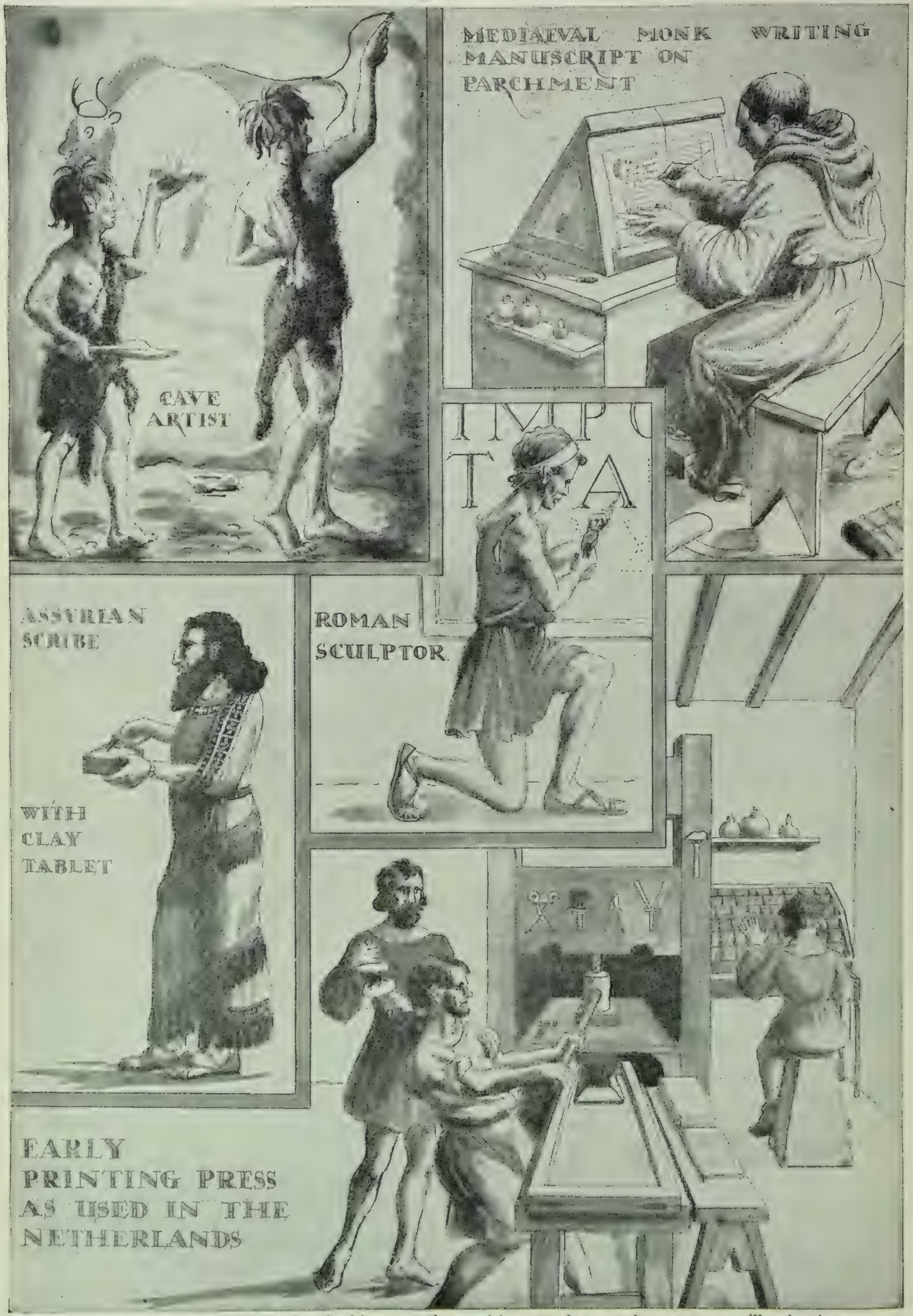
There are, of course, other rich treasuries: painting, sculpture, music, architecture and many more. To them all you may apply the same touchstone as you apply to books and, in their regard, the same touchstone also to yourself.

Do you find that last sentence difficult to understand? It is meant to be difficult. The key to it is the word touchstone. If you do not already know its meaning the dictionary will explain it, and then, I hope, the rest will be clear.

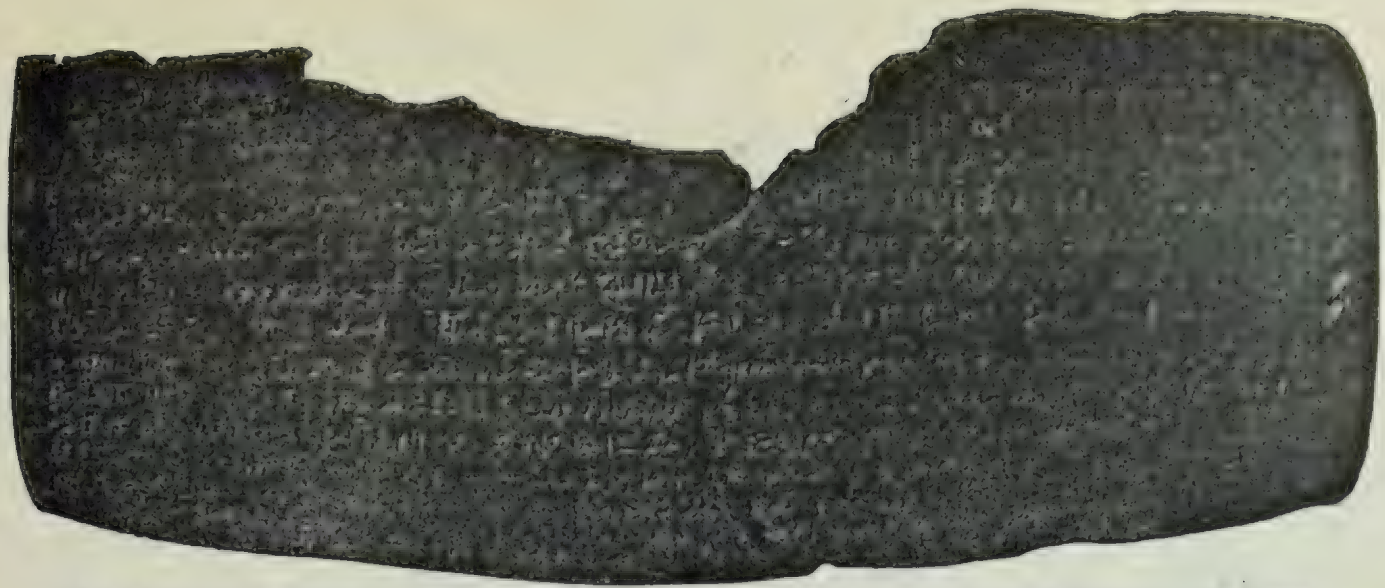
Stephen Southwold

THERE is a society continually open to us, of people who will talk to us as long as we like, whatever our rank or occupation;—talk to us in the best words they can choose, and with thanks if we listen to them. And this society, because it is so numerous and so gentle,—and can be kept waiting round us all day long, not to grant audience, but to gain it;—kings and statesmen lingering patiently in those plainly furnished and narrow anterooms, our bookcase shelves,—we make no account of that company,—perhaps never listen to a word they would say, all day long!—John Ruskin, "Sesame and Lilies."

EARLY ARTISTS AND PRINTERS AT WORK


MEDIAEVAL MONK WRITING MANUSCRIPT ON PARCHMENT
CAVE ARTIST
ASSYRIAN SCRIBE
WITH CLAY TABLET
ROMAN SCULPTOR
EARLY PRINTING PRESS AS USED IN THE NETHERLANDS

This picture shows man first drawing in his cave, then writing on clay, carving on stone, illuminating manuscripts, and, finally, printing.



The above clay cylinder is a historical record. It tells of the capture of Babylon by Cyrus.

HOW OUR BOOKS CAME

Much of our knowledge and our pleasure to-day comes to us through our reading. Had the method of printing with single, movable types not been invented, our books would have been very few and extremely hard to obtain. This section tells the wonderful story from the time when man first drew on his cave walls to the present day, when books are plentiful and cheap, and when newspapers are printed at the rate of over 400,000 copies per hour, and sold for a penny.

EVEN the birds and beasts have ways of speaking to each other, of warning each other, and of telling good news. So we can understand that, in the far off days before history begins to have records, the wild human beings of the earth wished to communicate with their fellows.

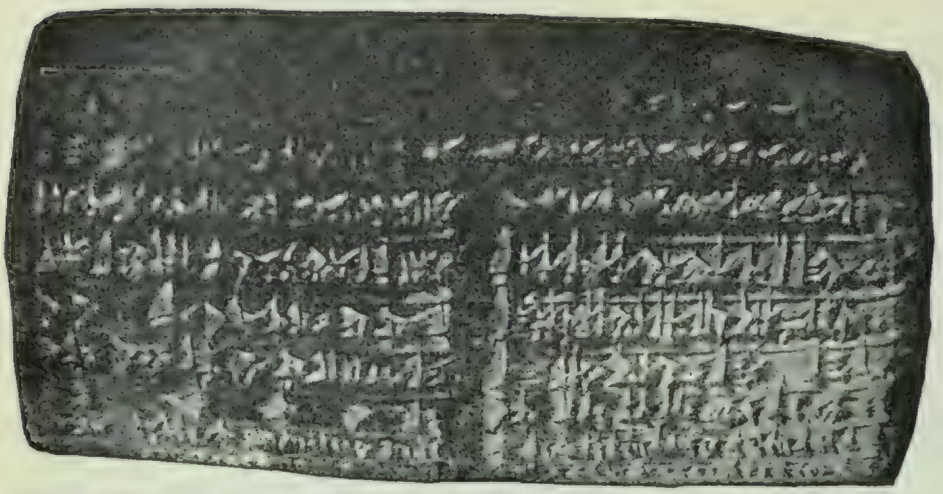
Thus they learned to speak, and invented certain sounds to mean certain thoughts. Later, they wished to set down those thoughts in a manner that would last, and so they first drew pictures on the walls of their caves. Later still they began to try and write messages. They sometimes did this by drawing sets of pictures. This was the manner adopted by the American Indians. Other folks had other methods. Some had sticks on which they cut notches, others marked pebbles or beads, while others arranged leathern thongs on a crossbar or made groups of knots on ropes.

The ancient Egyptians developed the picture writing idea until they produced what we know as hieroglyphics. These were word designs in the form of pictures or patterns. Many of these can still be seen carved on the ancient buildings in Egypt. Men wondered for years what these strange writings might mean, but no one could find the key.

Then one day, in 1798, a French officer of artillery in Napoleon's forces in Egypt found at Fort St. Julian, near Rosetta, a large black broken stone nearly four feet long by two feet wide. This stone was covered with writing carved into the surface, and it was noticed that there were three kinds of writing, the first being Egyptian hieroglyphic writing. Napoleon ordered exact copies of the writings to be made and sent to the scholars of France. They, and scholars of other nations, were puzzled for a long time, until one of them, Champollion by name, saw that the second writing was in Demotic, the later writing style of the Egyptians, and that the last writing was Greek, and that the same incidents were spoken of in both writings. He therefore thought that probably the first (the hieroglyphic) writing told the same story. From this comparison was slowly but surely built up some key to the reading of ancient Egyptian writings on papyrus (or paper made from reeds and leaves) and on the walls of the temples. The stone that thus gave the key to a whole world of wonderful history was called the Rosetta Stone, and if you are able to visit the Egyptian room of the British Museum you will see this great irregular shaped stone occupying pride of place there.

From hieroglyphics writing gradually developed, even though the alphabet had not yet come into being. The next step was to invent certain figures or designs to mean certain syllables, and you can guess there would need to be a vast number of such drawings to cover the thoughts of man's mind. It was a great task learning these, and consequently few people could either express themselves in writing or read what was written.

The rate of progress of reading and writing

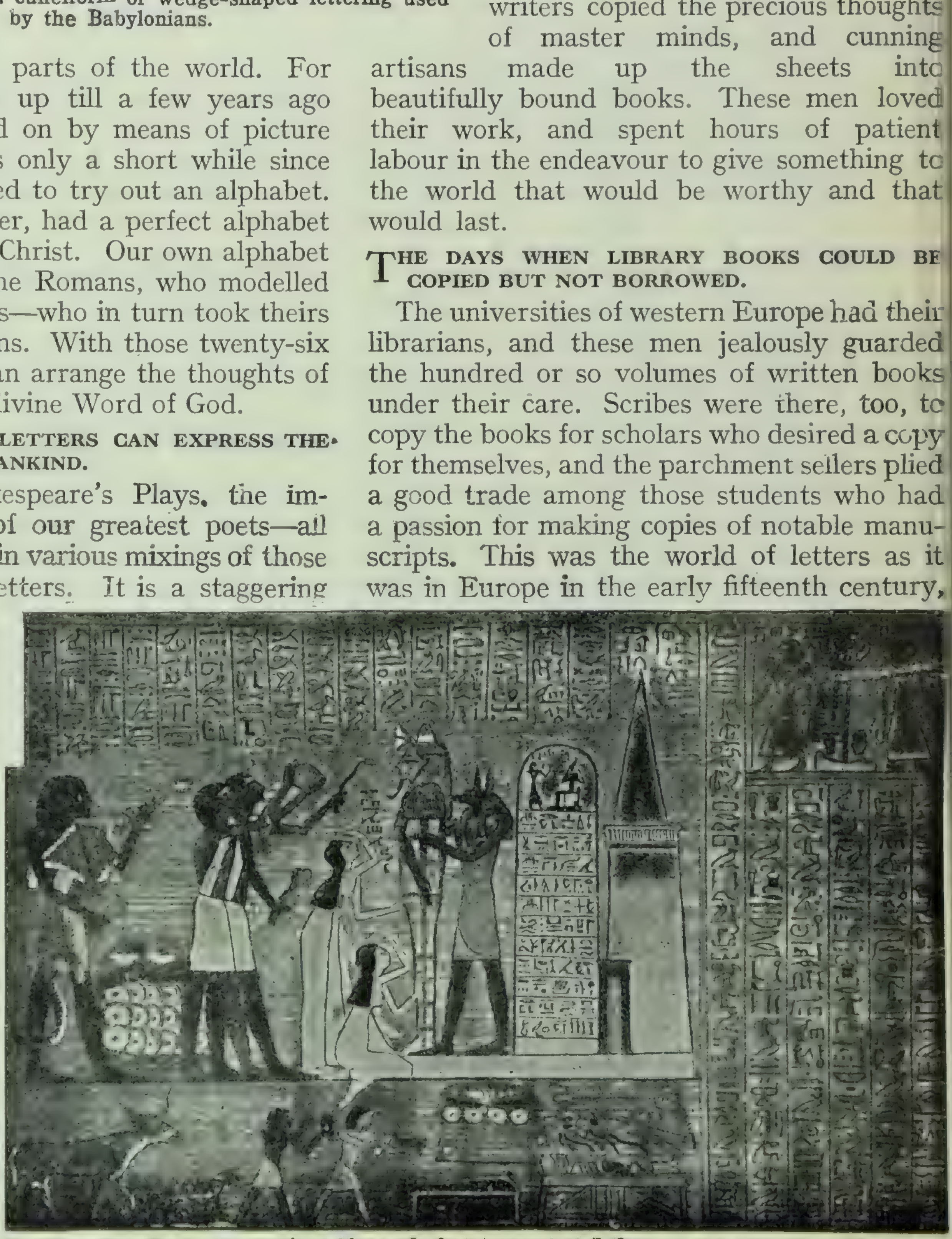


This cylinder, one of the four found in the Temple of the Moon at Ur, shows the style of cuneiform or wedge-shaped lettering used by the Babylonians.

differed in various parts of the world. For instance, in China up till a few years ago writing was carried on by means of picture drawings, and it is only a short while since the Chinese resolved to try out an alphabet. The Greeks, however, had a perfect alphabet before the birth of Christ. Our own alphabet came to us from the Romans, who modelled theirs on the Greeks—who in turn took theirs from the Phoenicians. With those twenty-six simple letters we can arrange the thoughts of mankind, and the divine Word of God.

HOW TWENTY-SIX LETTERS CAN EXPRESS THE THOUGHTS OF MANKIND.

The Bible, Shakespeare's Plays, the imperishable poetry of our greatest poets—all these are expressed in various mixings of those twenty-six simple letters. It is a staggering thought. And you know those letters. They are yours to play and work with, to assist you to build beautiful thoughts of your own and to open up to you the immortal thoughts of great men, that lie about you as groups of letters in printed books. It will be a joyful task to pry into the history of books, for their presence with us in such numbers and variety, and at so small a cost, is due to a simple discovery made some four hundred and eighty years ago—in the year 1454.

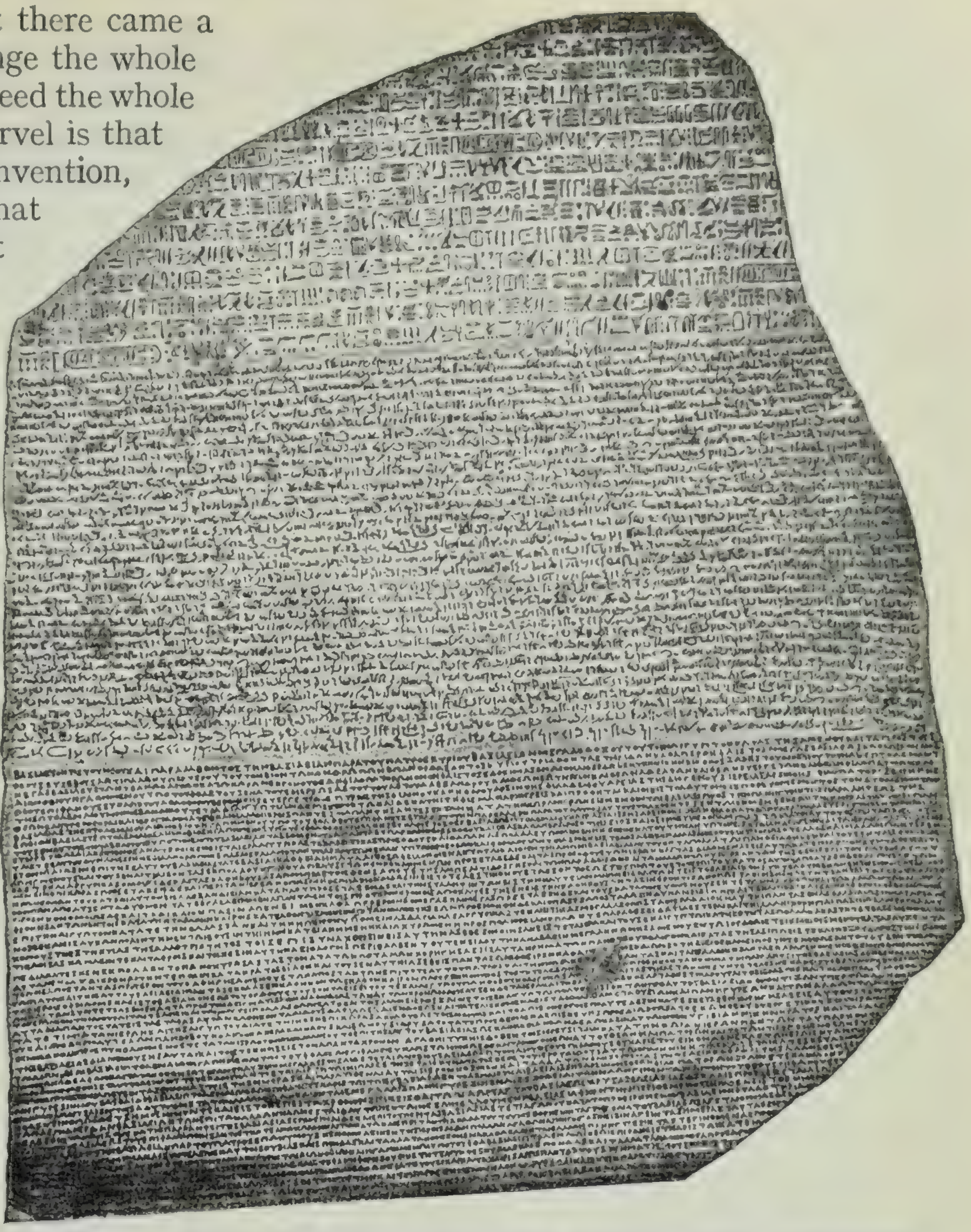


The Egyptians had many curious ideas of what was to befall them in the after-life. The above, from the Book of the Dead, shows a mummy going through curious rites in the tomb. Hieroglyphics are seen in the picture. Anubis, the jackal-headed god, holds up the mummy.

When nations found themselves possessed of an alphabet, and also o thoughts they considered worthy o passing on to others, books began to appear. Copies of these written books were most carefully and lovingly made by hand by monks and others. The desire to write became keen, and scholars hastened to set down the results of their studies. Skilled writers copied the precious thoughts of master minds, and cunning artisans made up the sheets into beautifully bound books. These men loved their work, and spent hours of patient labour in the endeavour to give something to the world that would be worthy and that would last.

THE DAYS WHEN LIBRARY BOOKS COULD BE COPIED BUT NOT BORROWED.

The universities of western Europe had their librarians, and these men jealously guarded the hundred or so volumes of written books under their care. Scribes were there, too, to copy the books for scholars who desired a copy for themselves, and the parchment sellers plied a good trade among those students who had a passion for making copies of notable manuscripts. This was the world of letters as it was in Europe in the early fifteenth century,



The Rosetta Stone, which bears inscriptions in old Egyptian hieroglyphics, in later Egyptian or Demotic and in Greek, furnished the key to hieroglyphics and opened up for us the records of ancient Egypt.

and it was into this world that there came a man who was destined to change the whole system of book-making, and indeed the whole fabric of civilisation. The marvel is that he did it with such a simple invention, and the greater wonder is that no one in Europe had thought of it before.

Though Chinese, Koreans and Japanese had long before used for printing movable type of clay, copper and wood respectively, it was left to John Gutenberg, of Mainz, to cut out separate letters, string them together as required, in words, and print the pages by pressure from a linen press.

There will always be argument between various people as to who really introduced into Europe the idea of printing with movable types. Some say a certain Laurens Janszoon Coster, of Haarlem in Holland, was responsible. Others say that John Gutenberg of Mainz was the pioneer.

We know certainly, however, that in the year 1454 the Pope wished to have a paper called an Indulgence circulated among the Roman Catholics of Germany, and this sheet was printed by John Gutenberg. We can trace nothing printed with type earlier than this.

WHEN PAGES OF LETTERS WERE CARVED ON WOOD AND THEN PRINTED.

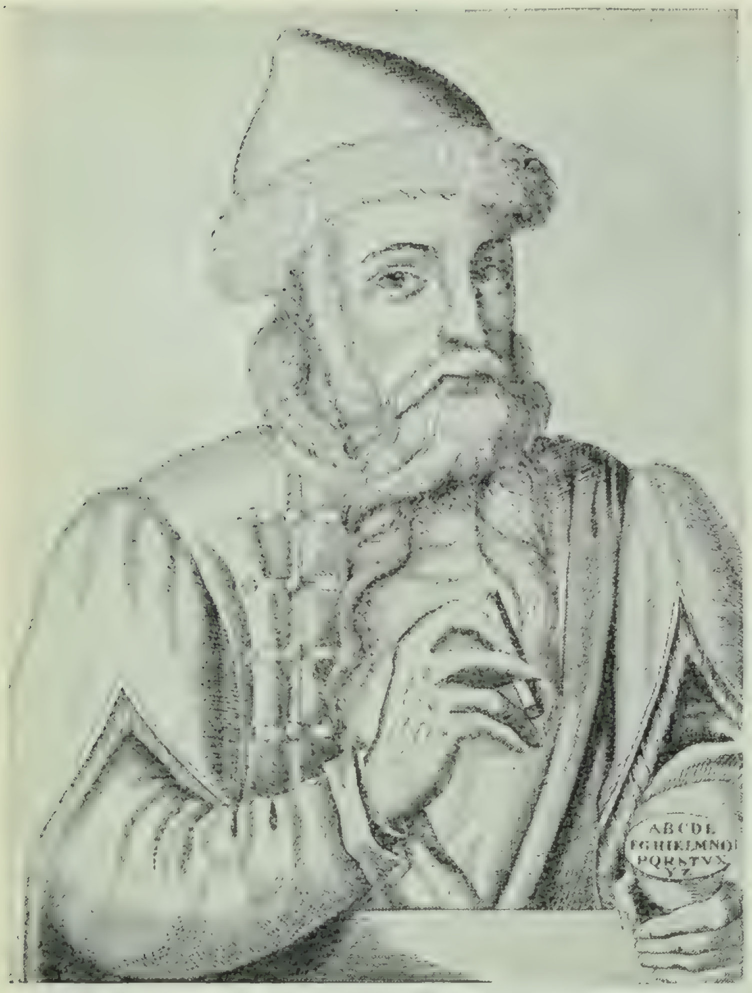
There had been various ideas for printing before this time, and people had, hundreds of years before, been near to discovering the method of printing with separate types. One of the chief ideas was to carve a whole page out of wood, and then print it. The page could only be used for one purpose, whereas type can be pulled to pieces and the letters used for other matter. The books printed from carved pages were known as block books, or xylographs.

John Gutenberg made some type and, joining with two other men, John Fust and Peter Schoeffer, began a printing business. In 1456 they produced a beautiful Bible which is nowadays known as the Gutenberg or Forty-two-line Bible, as it had forty-two lines per page. It was beautifully printed and the pages were decorated in colours by hand.

Poor John Gutenberg, though a clever man at making type for printing, was a poor business man, and when Schoeffer married Fust's daughter the inventor of the type was told his services were no longer required. So he had to leave the business and the firm of Fust and Schoeffer carried on, doing some remarkable work.

PRINTERS, IN OLDEN DAYS, HAD TO BE VERY PATIENT MEN.

The great idea soon spread to other German towns and later beyond the country's frontiers to Italy, France and later to our own islands. Each printer had to cut his own type before he could print, and so when he had printed a page he pulled down the type to set it for the next one. It was then a slow business, and



John Gutenberg, who introduced printing with movable types, from the original painting at Mainz in Germany.

when you realise that the printer had to perform no less than nine operations in printing each sheet, you will feel that the early printers were patient, heroic men.

They preserved for us, however, by this steady work and their pride in their craft, a precious heritage of lovely books, and kept alive for future generations the thoughts of great men of the past.

HOW WE HAVE COME TO LEARN SO MUCH ABOUT EARLY PRINTING.

It is interesting to learn how we know so much about early printing, and the actual time when the first printed book appeared in Europe. Gutenberg did not print on his Forty-two-line Bible the date on which it was published. This was discovered by chance over two hundred years later. In France, during the seventeenth century, one of the most powerful men was Cardinal Mazarin, chief minister of King Louis XIV. Now Mazarin loved books, and his library was world famous. After his death, when someone was going through his shelves, a copy of the Forty-two-line Bible was found, and inside the cover a clergyman of the fifteenth century had signed his name as having read the proofs of the book and found it correct. He put the date after his name. This forethought on his part made it possible for us to know with some degree of certaint the year in which Gutenberg started the a which was destined to revolutionise the who world of thought, of study and of amusemen

So printing progressed, and before lon artist-carvers cut pictures from blocks of woo and these were set up with the type to giv illustrated pages. These pictures were calle wood-cuts, and some of them were ver beautiful indeed, showing great skill on th part of the wood-cutter.

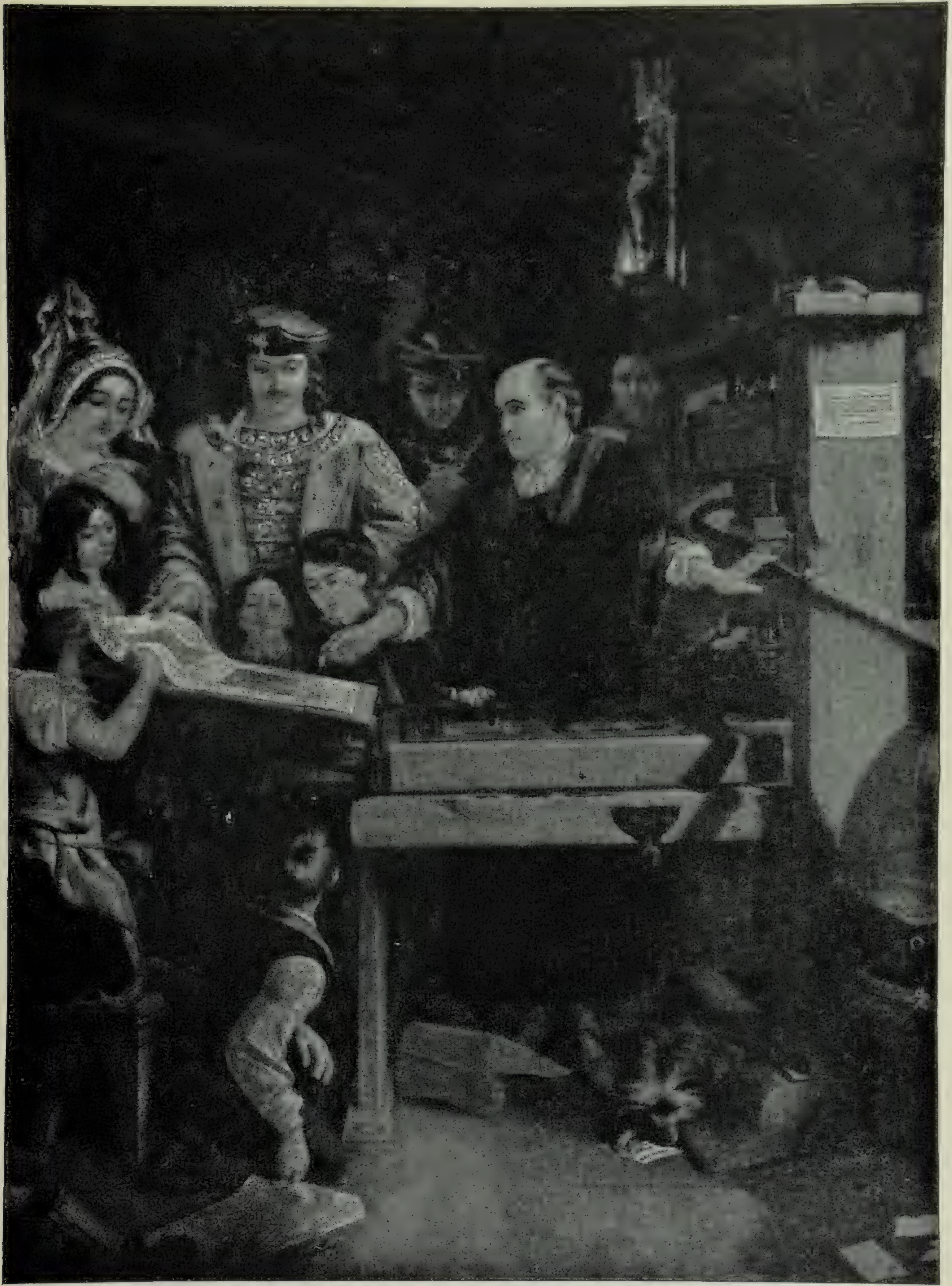
THOMAS BEWICK, WHOSE NAME IS FAMOUS I CONNECTION WITH WOOD-CUTS.

Later pictures were cut from soft metal and eventually some were engraved on coppe and steel. The most intricate wood-cut work was done in the nineteenth century by Thomas Bewick. He found that by using the hard end of the grain of his block of wood, instead of the "plank" or length, and by using an engraver's tool instead of a knife, as was the practice in that time, he could do much finer work. His wood-cuts have never been surpassed for delicate detail.

Printing came to England when William Caxton, in the year 1474, printed a book in the almonry of Westminster Abbey. Caxton

A statue showing Gutenberg, with two of his colleagues, Johann Fust and his son-in-law, Peter Schoeffer, an engraver with whom he formed a partnership.

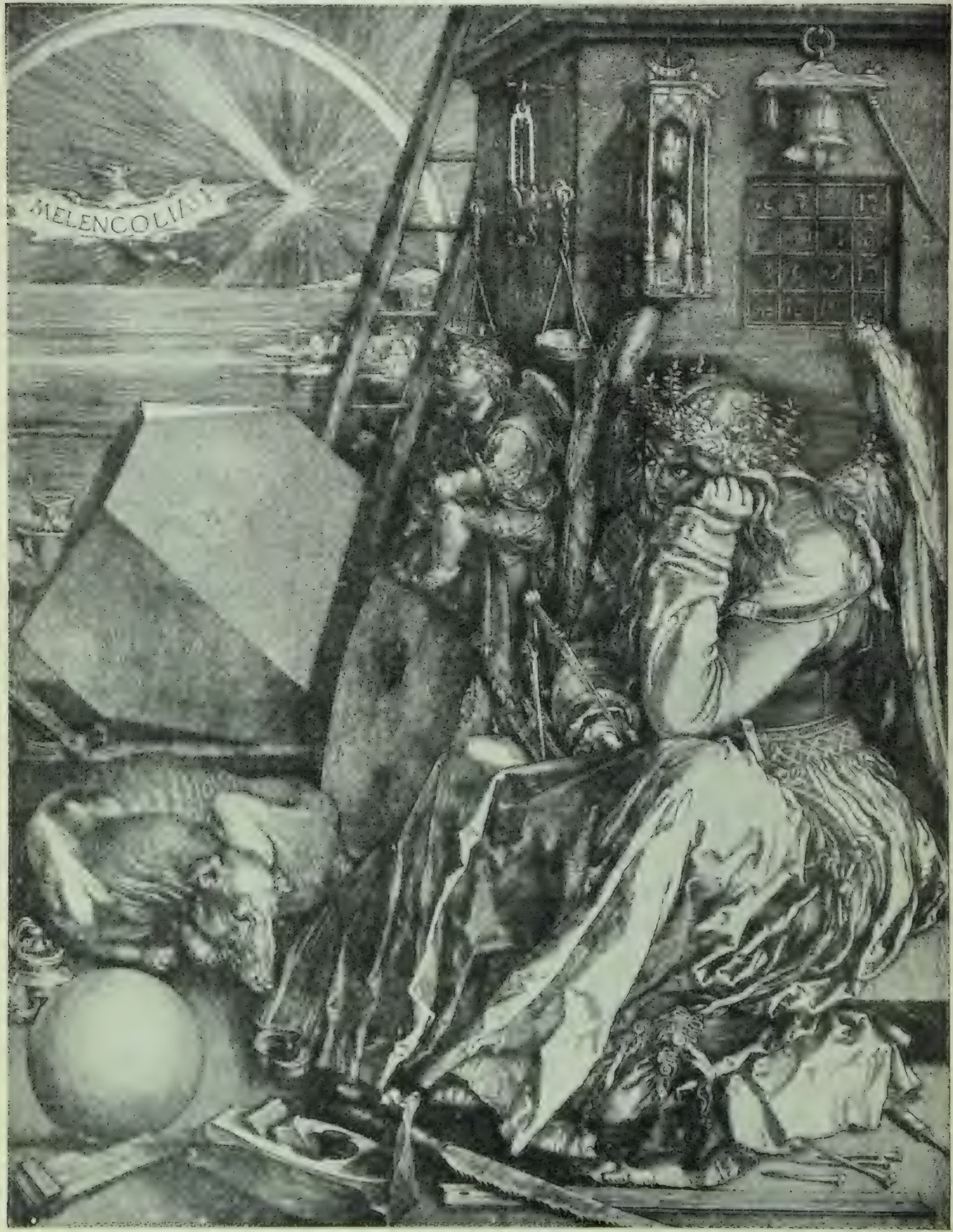
THE FIRST ENGLISH PRINTING PRESS



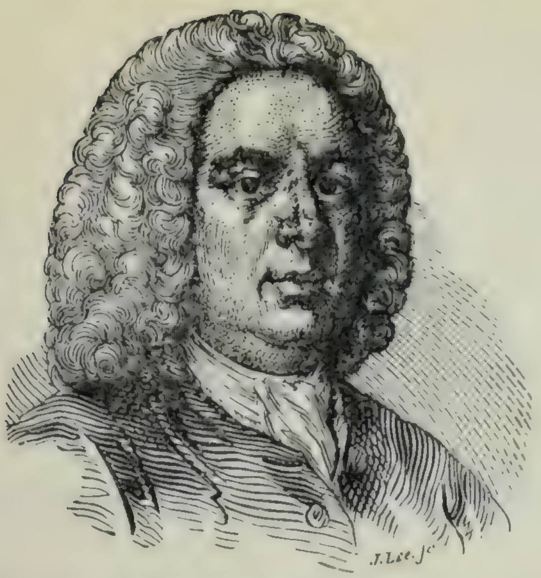
William Caxton studied printing abroad and finally set up a printing press of his own in the almonry, Westminster Abbey, in the year 1477, thus becoming the first English printer and publisher. In the painting above he is seen demonstrating his new press to King Edward IV. and his Queen, who look on with wonder and admiration.

A FINE EXAMPLE OF COPPER-ENGRAVING

Albrecht Dürer's delicate work



" Melancholy " is the subject of this remarkable copper-plate engraving by Albrecht Dürer (1471-1528). Dürer, one of a German goldsmith's eighteen children, became a clever designer and master of the art of wood and metal engraving. Note the detail in the above picture, and especially the folds of the garments. By these intricate folds Dürer's engravings can often be recognised. His work shows infinite patience and a marvellous eye for composition and form.



William Caslon, the engraver of gun-barrels, who gave us the first really fine types used in printing.
[*Caslon & Co., Ltd.*

had promised to supply to a number of friends a certain *History of Troy*, and he realised that to copy out this book a number of times would take him years and probably make him lose his eyesight. He therefore went abroad and in Germany and Belgium learned the art and craft of printing.

HOW CAXTON WAS ACCUSED OF BEING IN LEAGUE WITH EVIL SPIRITS.

Now the ignorant folks in England thought that the Evil One was concerned in this new magic art, and for safety's sake Caxton was given a workshop in the Abbey at Westminster, where no one dare molest him. In this room—the room where food and money were distributed to the needy by the monks—he produced his *History of Troy*, a book on Chess, and later the wonderful story of King Arthur and the Knights of the Round Table—known as Sir Thomas Malory's *Morte d'Arthur*. In all Caxton produced ninety-six books, page by page, on a simple press. He was then followed by his assistant, Wynkyn de Worde, who kept alive the art until it spread through the country.

In the seventeenth century there appeared a new kind of printed publication in England. This century was a period of civil war and discontent, and the printing of good books suffered. People were too busy deciding whether to be Cavaliers or Roundheads, or attempting to keep themselves and their homes safe during the fighting, to worry about buying and reading books.

Pamphlets, however, were printed by the hundred, and these were issued by the rival factions to slander their enemies. Thus printing suffered very much, for it did not matter how badly a pamphlet was printed so long as its readers could make out its message of hate. This greatly hindered the advance of printing, and gave it no chance to attain perfection.

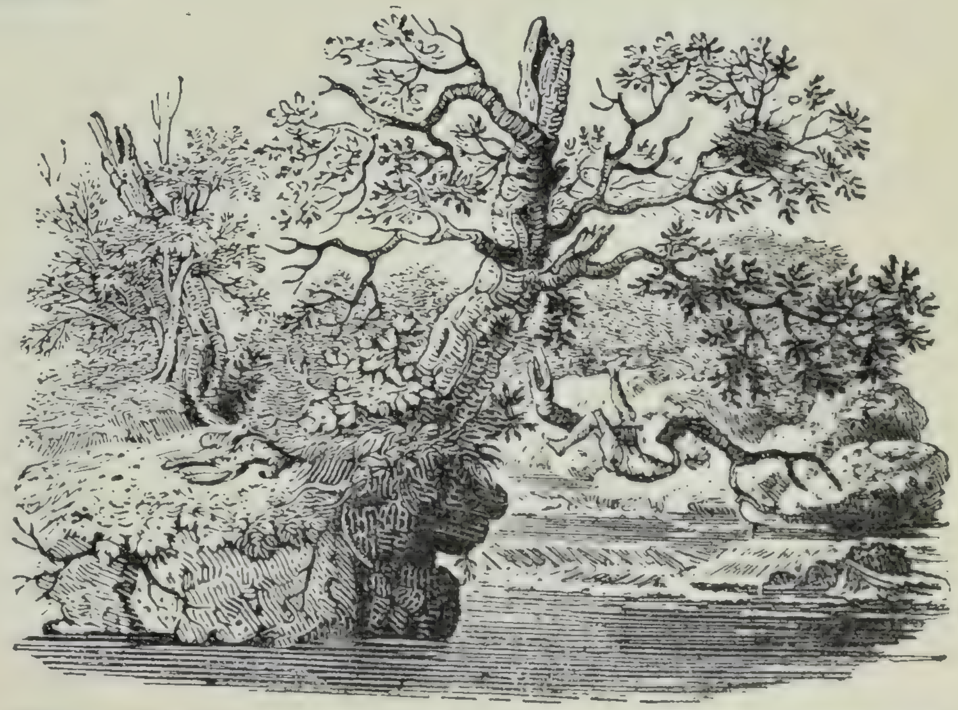
THE FIRST NEWSPAPER WAS READ BY CROWDS IN TAVERNS AND MEETING-PLACES.

A new style of publication did appear, however, and that was the newspaper. The *Weekly Newes* is the first newspaper we can trace, and it appeared in 1622. It was a real teller of news—a small sheet with no advertisements and no pictures. In the taverns and meeting places of men crowds would cluster round the happy possessor of a news sheet and listen as he read out what was happening in the country and in Western Europe.

In 1702 London's first daily paper appeared. It had two pages and was called the *Daily Courant*. By this time the invention of steam engines for driving machinery made possible better printing presses, and more speedy printing. Thus the production of a daily news sheet was becoming an easier matter.

HOW AN ENGRAVER OF GUN-BARRELS DESIGNED A NEW TYPE.

The type used in England for a long time had been purchased in the Continent, chiefly from Holland, but in the eighteenth century there appeared in England a most beautiful, clear Roman type designed by an engraver of gun-barrels, William Caslon by name. It is a coincidence that the name of the pioneer of good type in England should so nearly resemble that of the man who introduced the art of printing to our shores. There are only two letters difference in the two names.



Thomas Bewick was the pioneer of the art of woodcut illustration in England. Here is an example of a decoration from one of his books.

William Caslon was born in 1692, and became apprentice to an engraver of the barrel of guns. In those days some beautiful work was to be seen decorating the firearms used for sport and in war. You will see examples of these works of art in almost any museum to-day. Now it happened that a certain gentleman, John Bowyer, called one day at the gun-maker's shop and saw Caslon at work. He was so impressed by his accurate engraving and his tasteful designs that he introduced the young man to his friend Mr. James. Now Mr. James was a type founder and Caslon went to him to study the art of making types. The young man's skill in engraving and his knowledge of good design and form stood him in good stead when cutting punches from which new letters were to be cast.

PERSEVERING amidst reverses and numerous discouragements William Caslon finished the characters which were entirely used in printing that historic work, and therefore the excellent perform-

Here is an example of the beautiful "Old Face Roman" type cut by William Caslon.

HOW AN APPRENTICE ROSE TO FAME AND MADE HIS NAME WORLD-KNOWN.

In 1720 he set up business for himself as a type founder, in Chiswell Street, London, and before long sent round to printers a sheet of specimen alphabets of the various new types he had designed and was prepared to supply. That was over two hundred years ago, but to-day the same address will find the firm—and the beautiful, well-balanced Roman type that William designed and cut is still used the world over, and is known as Caslon Old Face.

Another maker of beautiful types was John Baskerville, and his italic, or sloping, type was really beautiful. So the making of better, clearer type helped to beautify the books that were printed, and the next improvements necessary were in the actual printing machines themselves, in the making of paper, and in the introduction of some method of printing good pictures showing things as they really were. These three great needs were supplied in the early nineteenth century, and together they made possible the rapid progress seen in printing and in the publication of newspapers, journals and books seen in the later part of the century.

This sloping style of printing is called italics. It is used nowadays for expressing emphasis.

An example of Baskerville's italic type.

A printing machine was invented by a man named Koenig, in Germany, in 1811. This machine made the printing of a sheet of paper a more speedy task, for the type was automatically inked by leather-covered ink rollers passing over it, instead of by hand, as previously. Other mechanical devices were introduced and each of these cut out some operation that had slowed up the printing on the old hand machines.

At the beginning of the nineteenth century two men, Foudrinier and Donkin, had invented a machine whereby paper could be made in continuous webs or rolls. As before their time paper had to be made by hand, slowly, in separate sheets, the new machine made paper more plentiful and cheaper. It also paved the way for the later type of printing machines, the rotary presses, on which the type is made into curved plates and placed round cylinders, and the printing done on five-mile reels of paper. This is the method by which modern newspapers are produced at very high speed to-day.

HOW PHOTOGRAPHY HELPED THE ILLUSTRATION OF BOOKS AND NEWSPAPERS.

The third invention was that of photography, an invention that paved the way for what is known as the half-tone process of printing photographs. The invention of photography by Daguerre, Niepce and the Englishman, Fox Talbot, is dealt with elsewhere in this volume. The method of half-tone production, so exceedingly interesting and ingenious, is worthy of explanation here.

If you look at a photograph you will see that it repeats the light and shade of the subject it represents. The picture is one of lights and shadows, rather than one made up of lines (as in a drawing). Now printing depends upon definite shapes, as when one is printing the metal touches the paper with the same pressure and the same amount of ink at all points. Thus you see that a photograph could not be printed in the ordinary way. There are no definite masses about it. The printing press would print black, if black ink were used, and there would be no half tones of gray, as are seen in a photograph.

HOW LIGHT AND SHADE CAN BE SHOWN IN HALF-TONE PRINTING.

Now take a magnifying glass and look at any of the photographs reproduced in this volume. You will note that it is composed of dots of black ink, some very large and near together, others very small and wide apart. Even the light parts of the picture have black ink dots in them. So you see that by printing in dots it is possible even in rapid newspaper printing to show the lights and shadows of a photograph. How is the picture thus split into dots?

In preparing a photograph for reproduction in a book the photograph is re-photographed through a glass screen ruled in criss-cross lines. The more lines there are, and thus the closer together they are, the finer will be the half-tone picture. The image of the photograph is thus split up, by the crossed lines, into little dots, as the light cannot pass through the lines on the screen. The darker parts of the picture will have large dots, very near together while the lighter parts will have tiny dots far apart.

HOW THE HALF-TONE BLOCK, TO PRINT THE PICTURE, IS PREPARED.

The plate on to which the photograph has been photographed is now placed in a printing frame and a copper plate coated with chemicals placed beneath it. The frame is exposed to light, and in the parts of the copper plate that have received light on them the chemical will have changed so that it is easily washed away when developed. The darker parts, that is, the dots, will remain.

Then the plate, with its dots protecting the plate underneath them, is placed in an acid, which eats away the parts not protected by the chemical. When the process is complete the copper plate shows the picture in dots standing out from the background. These dots take up the ink and print the picture.

You have seen a rainbow, and perhaps you have noticed the rainbow colours when light is seen through a three-sided piece of glass, called a prism, or through the bevelled edge of a mirror. These colours, seven in number, and coming in this order: red, orange, yellow, green, blue, indigo, violet, are the colours found in white light.

When light goes through a camera, to send the image of a scene or a person into the photographic plate or film inside, all these colours are present. They have blended together, however, to form white light.

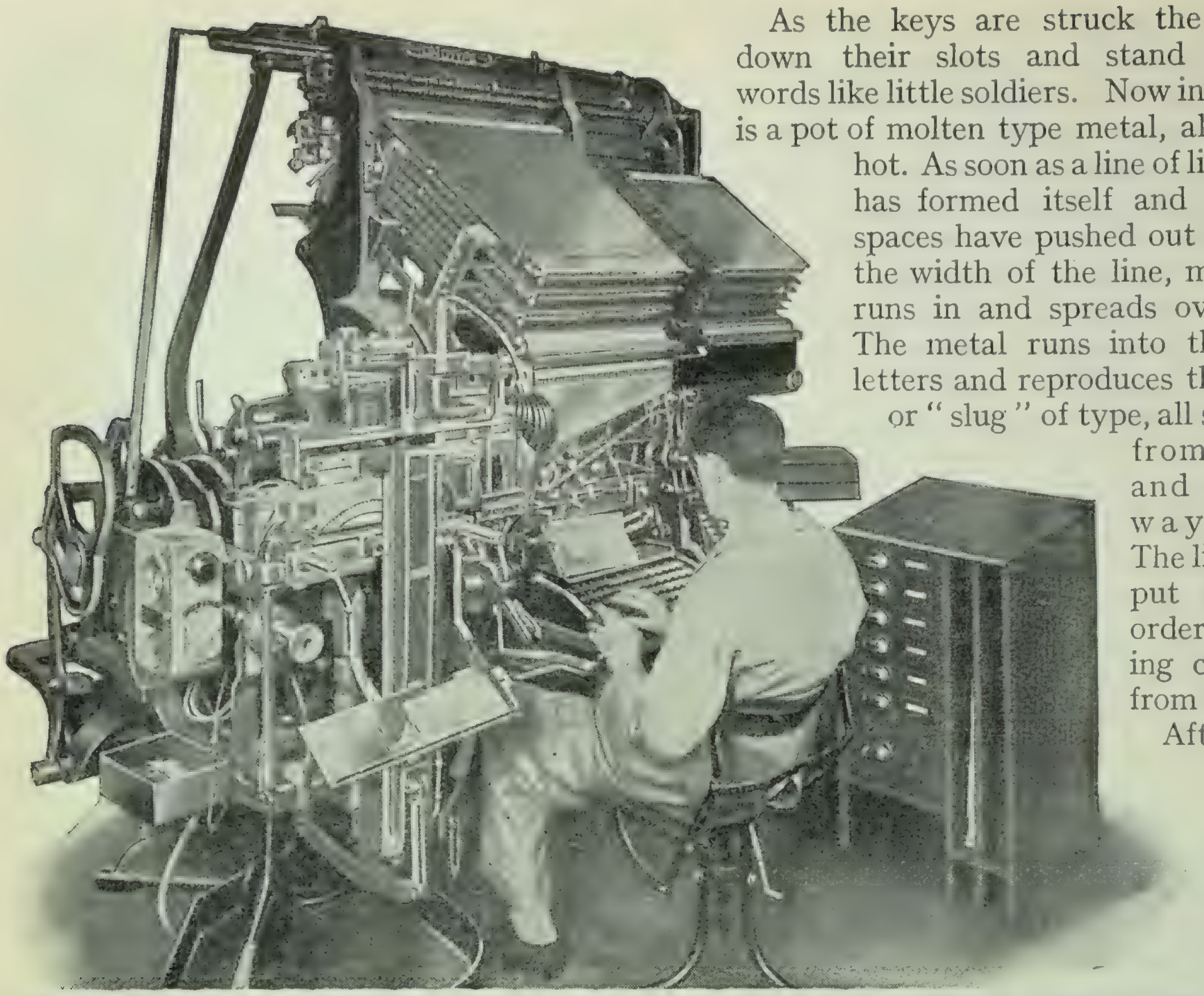
If you wish to try this blending experiment, take a circular piece of cardboard and round it paint or chalk colours as in the sketch, going through from red to indigo and then repeating until the whole disc is covered. Now make a hole through the centre, push a lead pencil through the hole and spin the card round as quickly as you can. The colours blend and form a grayish white. If you do this under a powerful light the card will seem to lose all its colour and become white.

HOW A COLOURED PICTURE IS PRINTED IN ALL ITS TINTS AND HUES.

Now after the invention of the half-tone process, experimenters began to search for some plan of printing, by half-tone, in colours. This is how the matter was eventually solved. It was known that if an object be photographed and a coloured screen or filter be placed between object and film or plate, the parts of the object containing that colour will not photograph, but other colours will get through the filter on to the plate and be photographed.

So it was thought that if three photographs of the same object could be taken from the same position, one only allowing the yellow parts to be photographed, another only the blue parts and another only the red, the three photographs could be made into half-tone blocks—that is, split up into dots—and the three blocks printed one on top of the other, with yellow, blue and red ink respectively.

This proved a success and is what actually happened when the colour pictures for this volume were printed. Each of these colour plates has been through the presses at least three times before reaching this book.

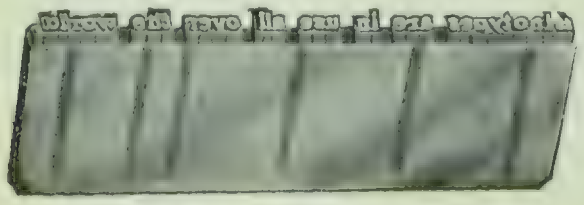


A Linotype operator at work tapping out his "copy." On the left is the tray where the slugs of type cast by the machine are deposited. [*Linotype and Machinery, Ltd.*

Let us now look at the actual printing of books and papers. In the olden days the types were set up letter by letter, by hand, and this was an exceedingly slow process. Nowadays there are, among others, two very efficient and speedy methods. They are the linotype and the monotype.

THE WONDERFUL LINOTYPE MACHINE THAT CASTS TYPE IN LINES.

The linotype machine is a wonderful mechanism which not only sets the type as an operator presses down "typewriter" keys, but casts the matter in solid lines of metal, just the width required for the page or column. The operator strikes his keys and, as it were, types down his line of words. Up in the machine, each in their respective slots, are metal shapes known as matrices. Each has engraved in its edge a letter of the alphabet.



A slug from a Linotype machine.

As the keys are struck the letters run down their slots and stand together in words like little soldiers. Now in the machine is a pot of molten type metal, always piping hot. As soon as a line of little matrices has formed itself and clever little spaces have pushed out the words to the width of the line, molten metal runs in and spreads over the line. The metal runs into the engraved letters and reproduces them in a line or "slug" of type, all standing out from the slug, and all wrong way round. The lines are then put together in order and printing can be done from them.

After each line of clever little matrices has done its job, it is carried up until it reaches the top of the machine, where is a distributing rod to which the matrices cling by their teeth. They are pushed along the rod by screws. Now each matrix has its edges cut like the edge of a Yale key—and no two letters have the same notchings. The distributing bar is also notched at intervals according to a set scheme. So the clever little fellows slide along over the tops of the letter cases until they reach home, when the bar releases them and they one by one fall into their own boxes. Thus Z will only fall into the Z box, M into the M box, etc., all ready to run down at the operator's command and help to line up and form, along with other letters, another word or line of type. After the type has been used the slugs are returned to the melting pot.

THE MARVELLOUS MONOTYPE PAIR, KEYBOARD AND CASTER.

Then there is the wonderful monotype pair of machines. The monotype differs from the linotype in that it gives the letters of type separately, while the linotype gives a line of type, all in one piece.

The monotype consists of two machines; the keyboard and the caster. These may be in separate rooms, for the type is not cast into metal on the machine that sets it, as in the case of the linotype.

Imagine a huge typewriter, with a roll of paper above it. As the operator types out the matter that is to be set in type, the paper shows holes, punched through it, until when the work of typing is done a roll of perforated paper appears, not unlike the roll in a pianola or player piano.

The operator at the Monotype keyboard punches holes in a roll of paper. [*Photo.: Monotype Corporation.*

THE MACHINE THAT CASTS SEPARATE TYPES FROM A ROLL OF PAPER.

The roll is now taken to one of the most "intelligent" machines it is possible to imagine and is fitted into position. At the word "Go"—in other words, when the operator sets the machine in motion—separate types are cast in metal at an amazing speed. Not content with the mere casting of letters in type, the machine arranges these in line, in words, and makes every line the proper width. Thus it goes on, line after line, and as you watch the tray filling with lines of type, made by a machine from a perforated roll of paper and a cauldron of molten metal, you marvel at the ingenuity of man, who can thus make a machine that almost thinks.

Through the tiny holes in the roll, as it moves round on the caster, go blasts of compressed air. The air, rushing through the various holes in turn, releases pistons and wedges that in turn move a box of matrices or type moulds, so that the proper one comes up to the centre, where molten metal is squirted into it. The metal solidifies, and out comes as a perfect little letter of type.

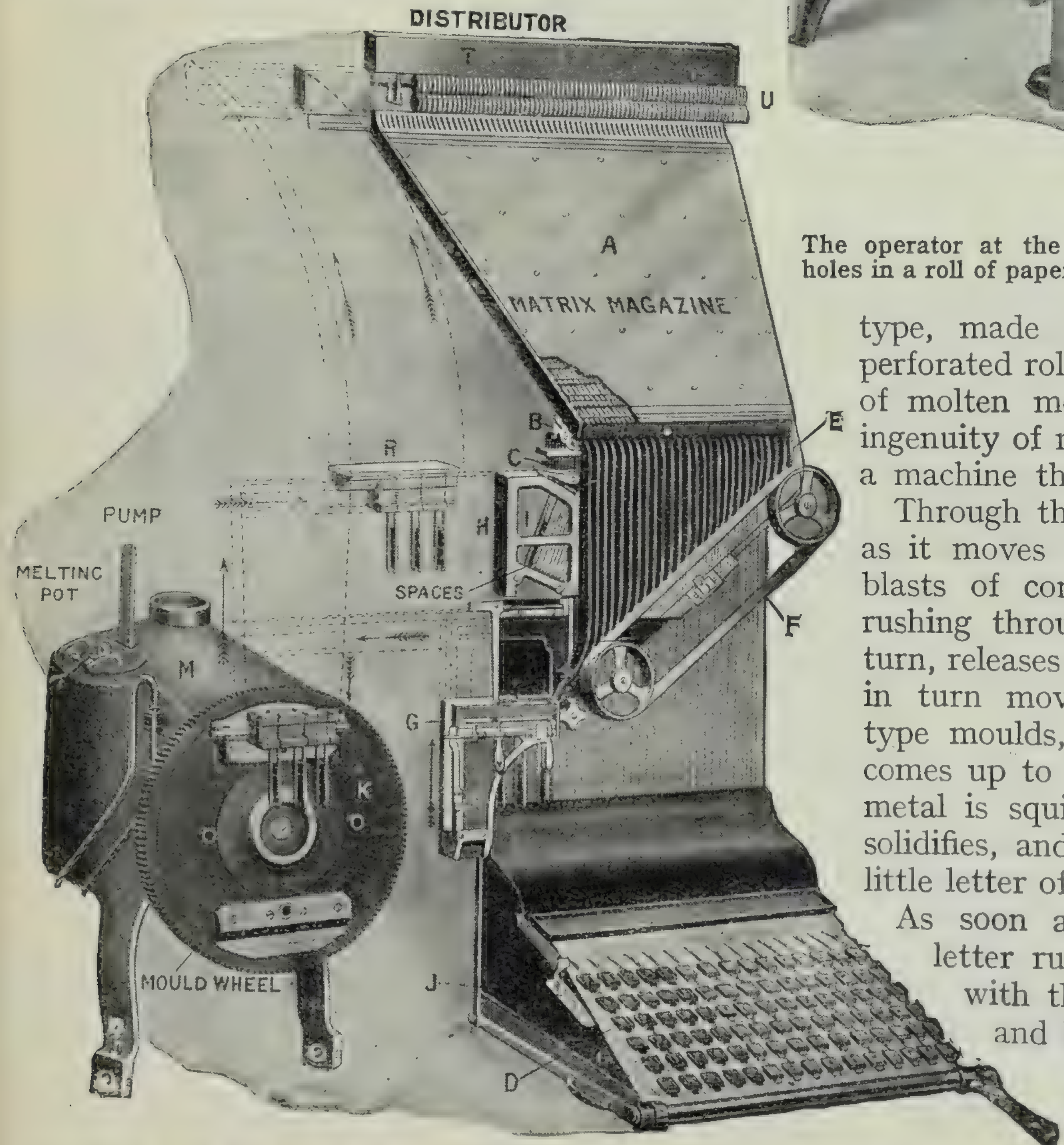
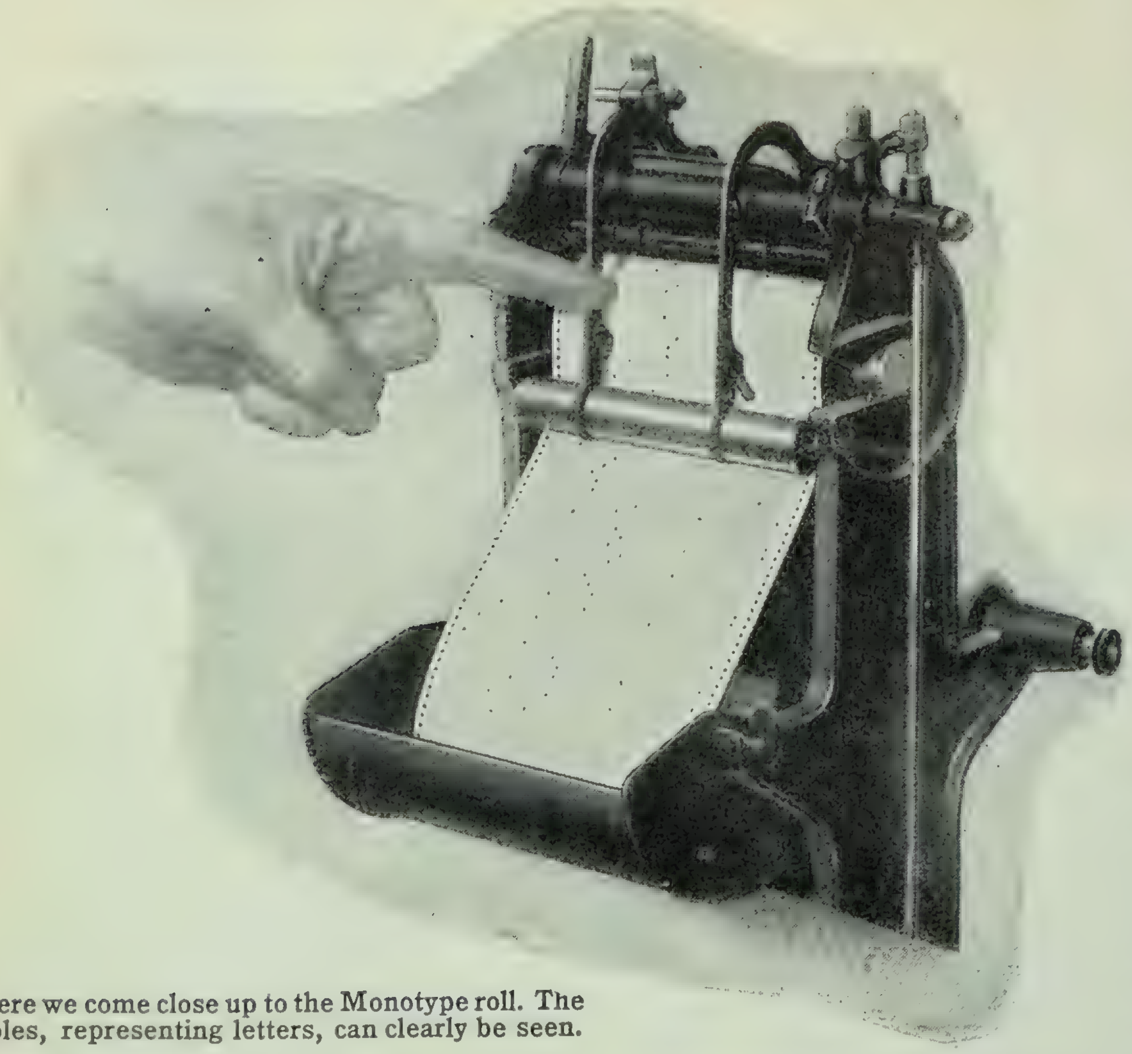


Diagram of the working of a Linotype machine. Note the slots for the respective matrices (A) and the hanging spacing bars (R). [*Photo.: Linotype and Machinery, Ltd.*

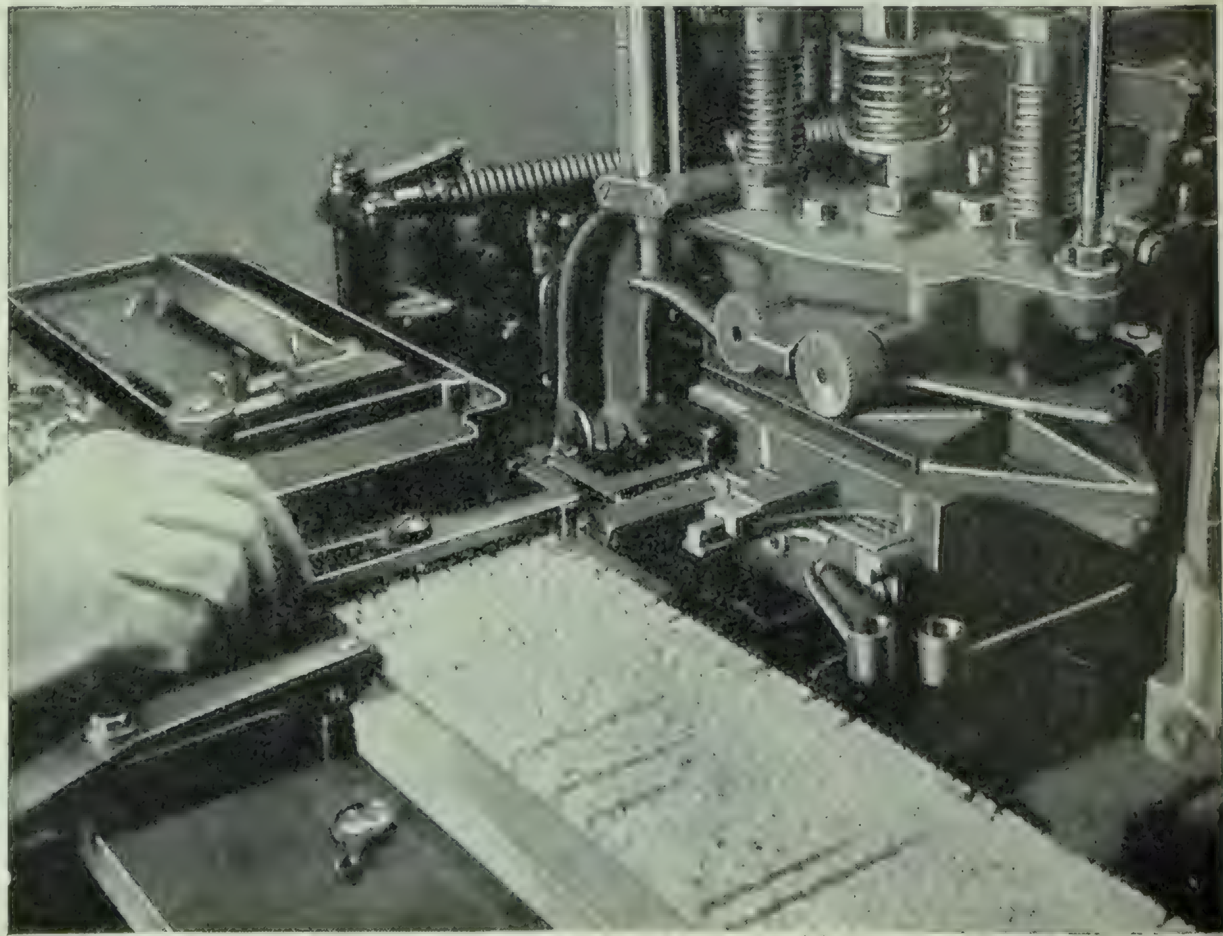
As soon as he is born the little letter runs along to take his place with the one born before him, and before he has settled himself he finds another coming up to the other side to join him in making a word.



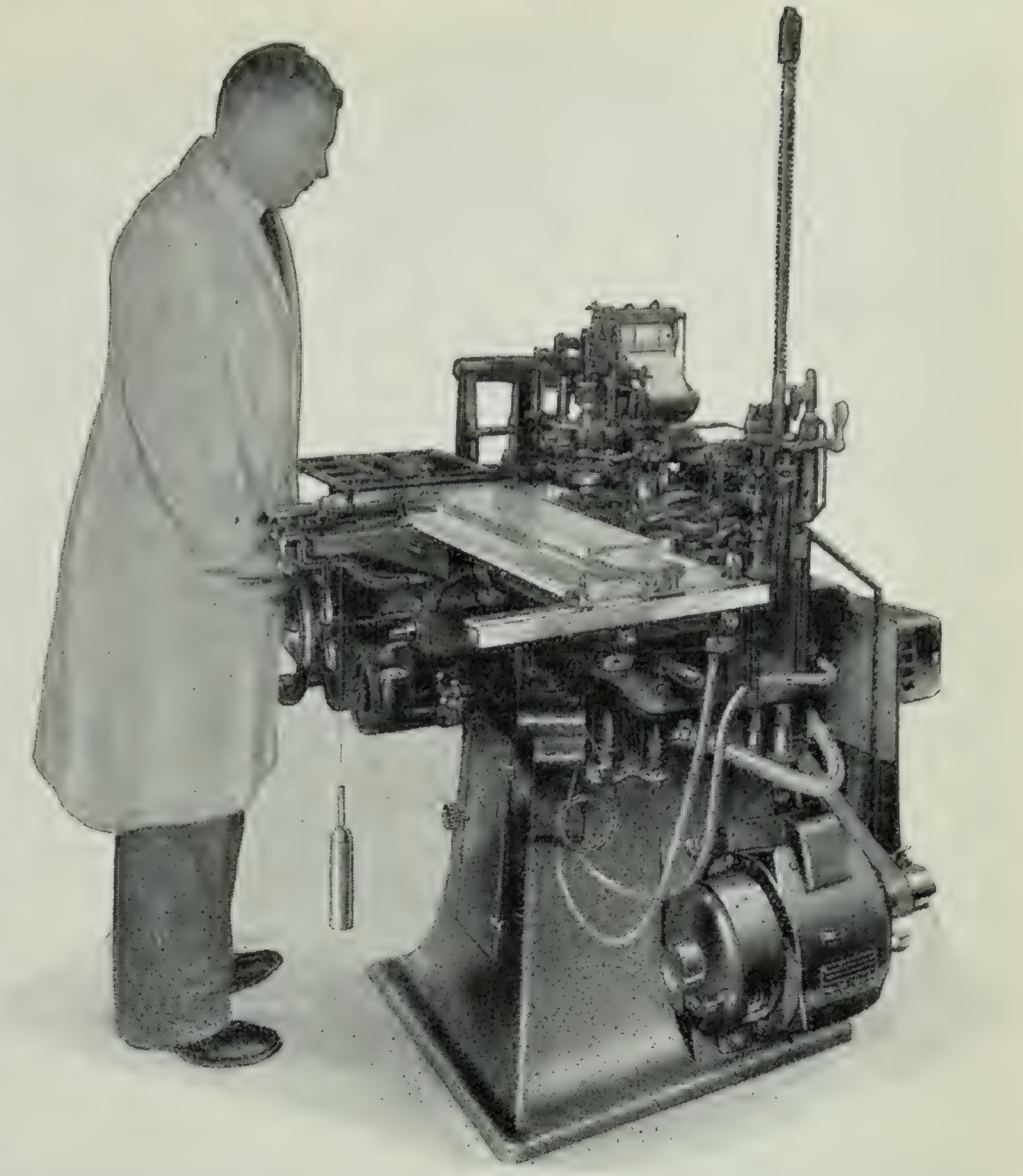
Here we come close up to the Monotype roll. The holes, representing letters, can clearly be seen.

The roll of paper is then put away and can be used again if more type for that book is needed. For instance, perhaps the book has first been set in large type and later a smaller copy, in small type, is required. A matrix box for small type is put in the caster and the roll placed in position, and the same book is set up again in smaller type.

NOW let us suppose the type is all set, and the book is ready for setting up for printing, and let us follow the process. The pages are not printed one at a time as in the olden days. Sixteen pages or thirty-two, or even sixty-four pages may be printed on one side of a sheet of paper at once, and some machines, called perfecting machines, print both sides of the paper at once. So 128 pages of a book may easily be printed on one large sheet. This requires a great deal of planning, for when the sheet is doubled up ready for sewing to the other sheets to make a complete book, every page must be in order. Suppose you had to print a sheet of paper holding only eight pages on each side, and fold so that they would be in proper order, how would you do it? Try it, by folding a large piece of paper in two, then in four, and finally in eight. You have now a book of sixteen pages, but its edges are not cut. Try to number the pages, in big figures, from one to sixteen. Open out the paper again, and you will see how hard it is to plan a book to work out properly.



The Monotype caster is here seen at work, quickly and without error casting a "galley" of type. The letters are all cast separately. *[Photo.: Monotype Corporation.*



The operator watches his marvellous Monotype casting machine turn out types and form its words and lines at amazing speed. [*Photo.: Monotype Corporation.*

Now the book goes to the printing machine. It may be printed on a flat machine, where the type lies flat on the bed of the machine and ink rollers pass over it, or on a rotary machine, where the type is cast into solid curved plates, fitted round a cylinder, and the pages printed on a continuous roll of paper. You see pictures of these two types of machines in these pages.

FOUR HUNDRED THOUSAND NEWSPAPERS EVERY HOUR.

After printing, the sheets are folded, placed in order and sewn together. Next they have their edges trimmed by a huge *guillotine* or knife. They are squeezed down to the thickness required, and a cover is fitted to them. Nowadays covers may be put on very quickly by machinery. The sewn book is put into a machine that gums its outside pages, or *endpapers*, and then, as the gummed book comes round on a swinging rod, the cover is slipped over and worked into proper position. The books are then put into a press until dry.

THE printing of newspapers is a very big task, and it must be done speedily without a hitch. Every day the presses turn out their daily paper, and the very latest news must appear in the edition being printed. Newspapers are printed on huge rotary machines that can eat up five-mile rolls of paper like lightning, and turn out nearly half a million neatly folded newspapers all counted and in perfect order, every hour. You will see from the photographs given later that these monster presses are marvellous pieces of machinery. The type has been set and when finally approved and arranged, and the pictures placed in their positions, the matter is cast into curved stereotype plates.

HOW STEREOTYPE PLATES ARE MADE FOR PRINTING NEWSPAPERS.

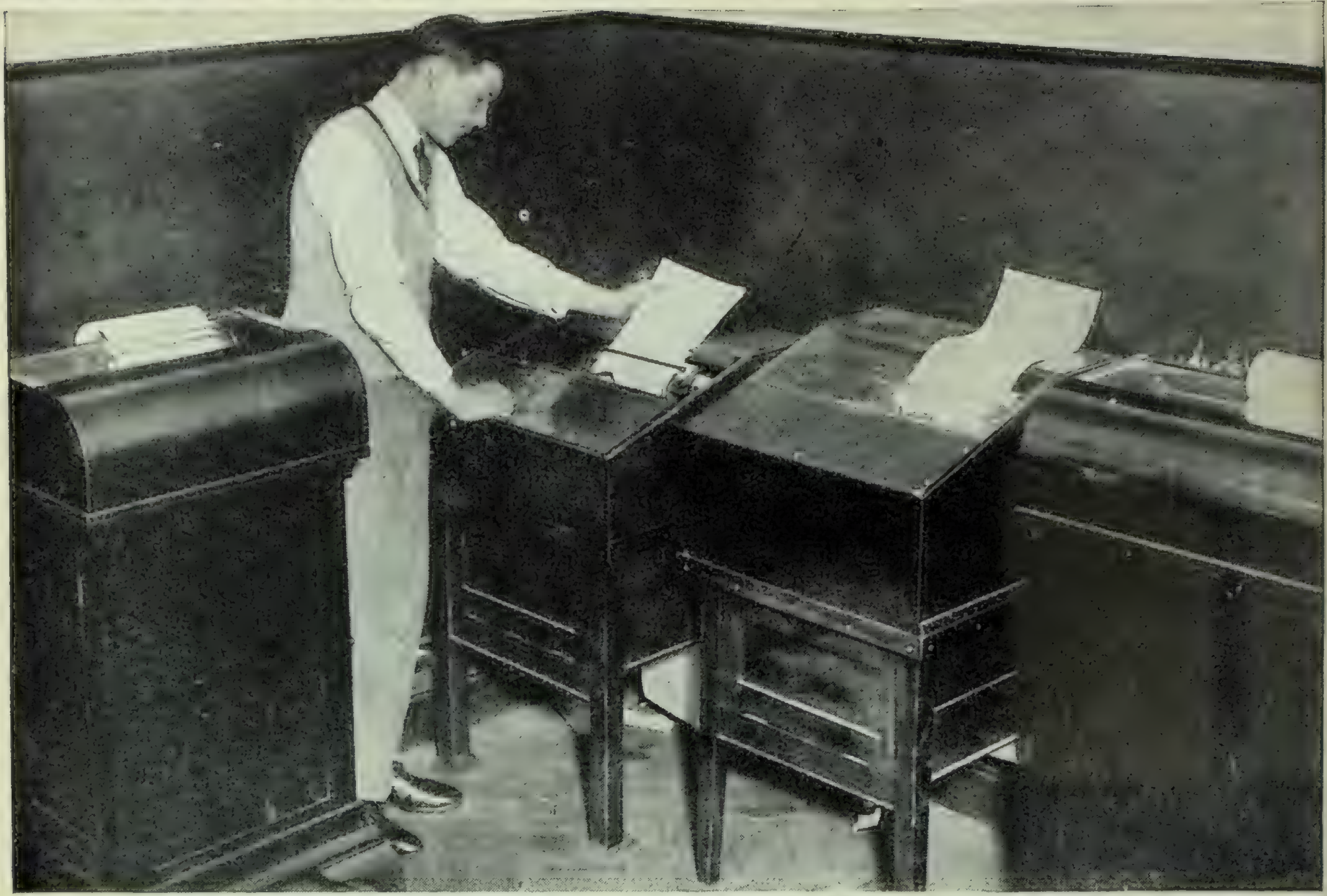
This is an interesting operation. The type of a page of a newspaper is laid down on a flat surface, fixed in a frame or chase so that it cannot slip. Then a sheet of specially prepared card, known as dry flong, is placed over it. The whole goes under a press where by means of heat and great pressure the type is made to push itself into the card, leaving an exact copy cut into it.

The card is then fitted into a casting machine and molten type metal allowed to run in. The metal runs into all the little cuts or type shapes, and solidifies. A plate is then made, bearing on its curved surface exactly what was on the page of type. The stereotype plates are then screwed into position on the cylinders of the printing machine, and off goes the monster, eating up the rolls of paper and delivering hundreds of thousands of newspapers, sold almost before the ink is dry.

There is an ever-growing wonder surrounding the making of books and the building up and printing of newspapers and journals.

You should always look upon a printed page as a live thing, for you are being privileged, when you read it, to pry into the mind of some one who has a message for you—some news to impart, a story to tell, a lesson to teach, or an immortal idea to communicate.

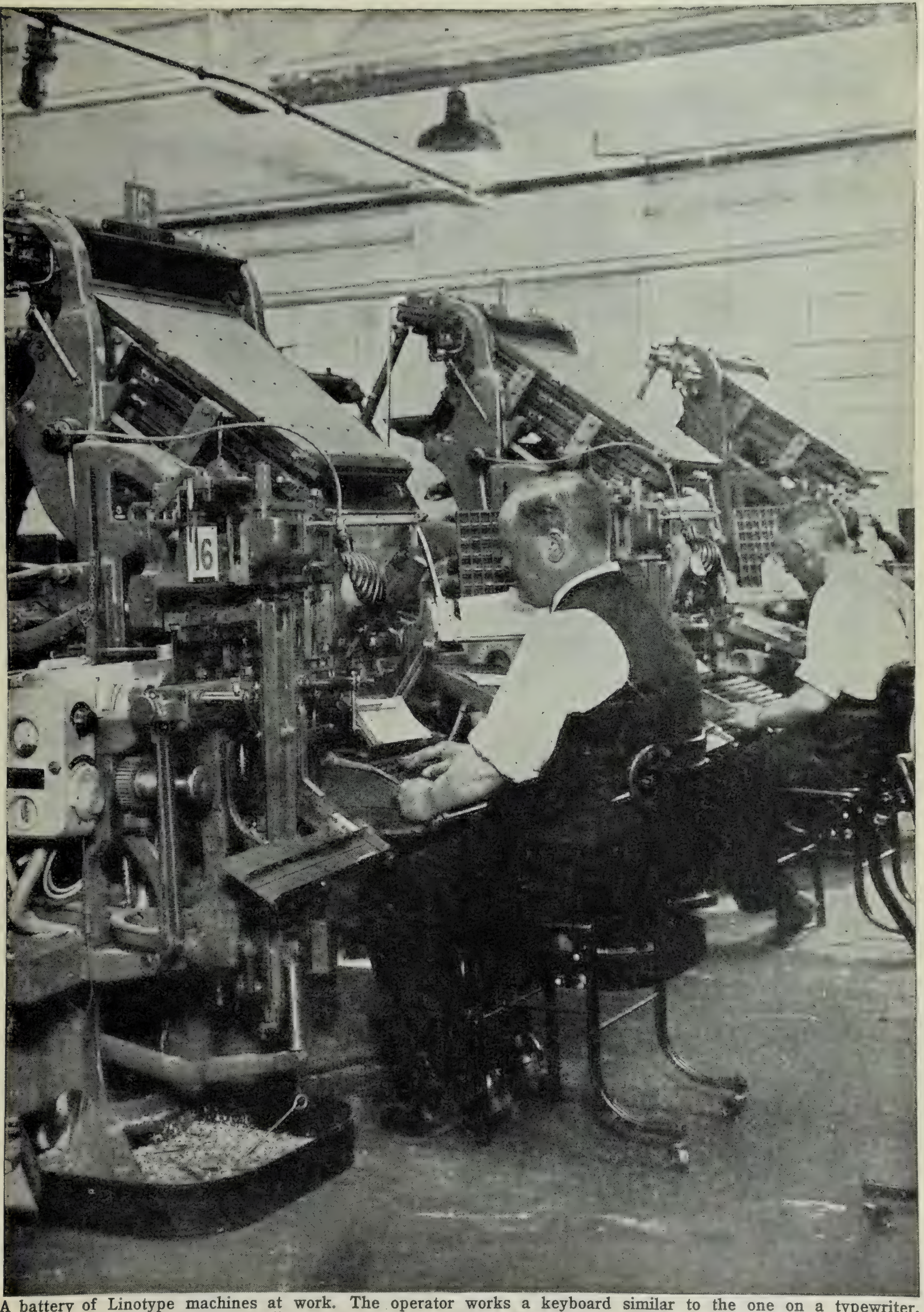
BEHIND SCENES IN THE NEWSPAPER WORLD



Here is the story in pictures of how a modern newspaper is produced. The pictures on this and the following pages were taken in the offices and press-rooms of the *Daily Herald*. Reports of the world's happenings come to us from news agencies and exchanges all over the world by a wonderful telegraph instrument, the Tape Machine which you see above. This machine prints messages on a moving paper tape.

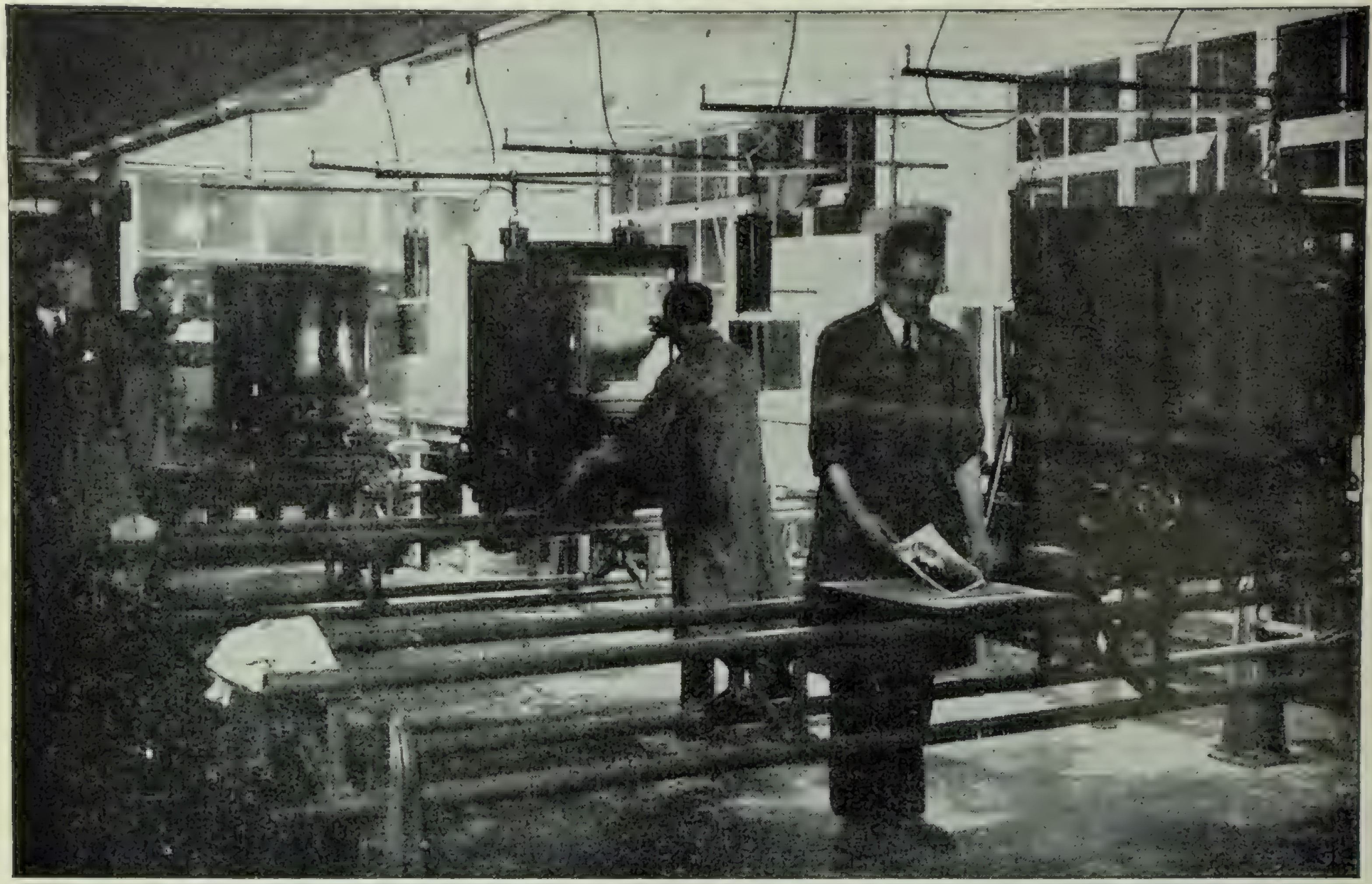
It is the work of the Editor and Sub-Editors of the newspaper to select the most important and interesting news for us. This is a corner of the News-Room, where Sub-Editors are busy sifting out the day's stories for publication.

HOW THE LINOTYPE DOES ITS CLEVER WORK

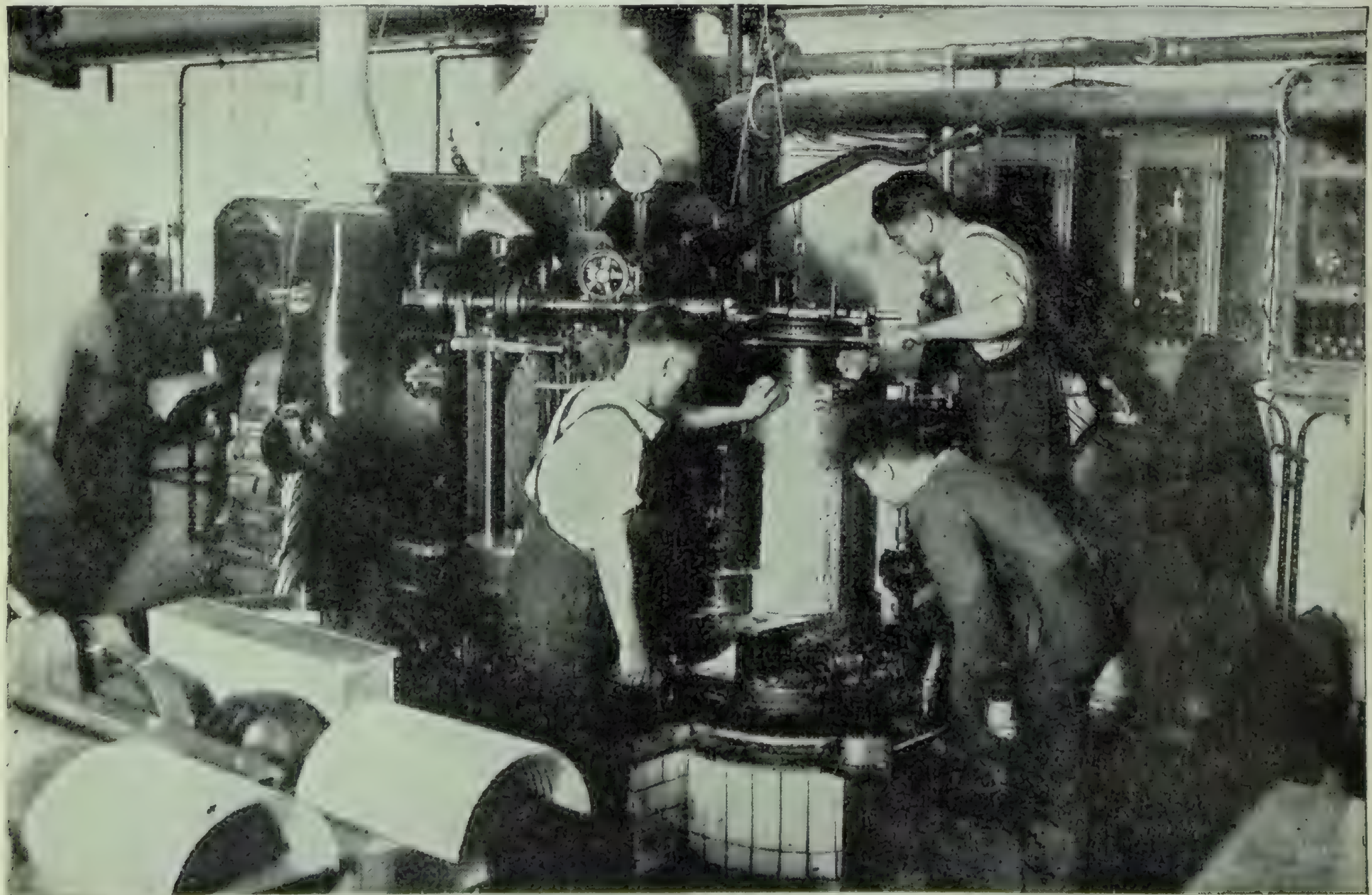


A battery of Linotype machines at work. The operator works a keyboard similar to the one on a typewriter. The machine automatically sets up metal type in lines, thus saving an immense amount of time.

PRINTING PICTURES FOR THE PRESS

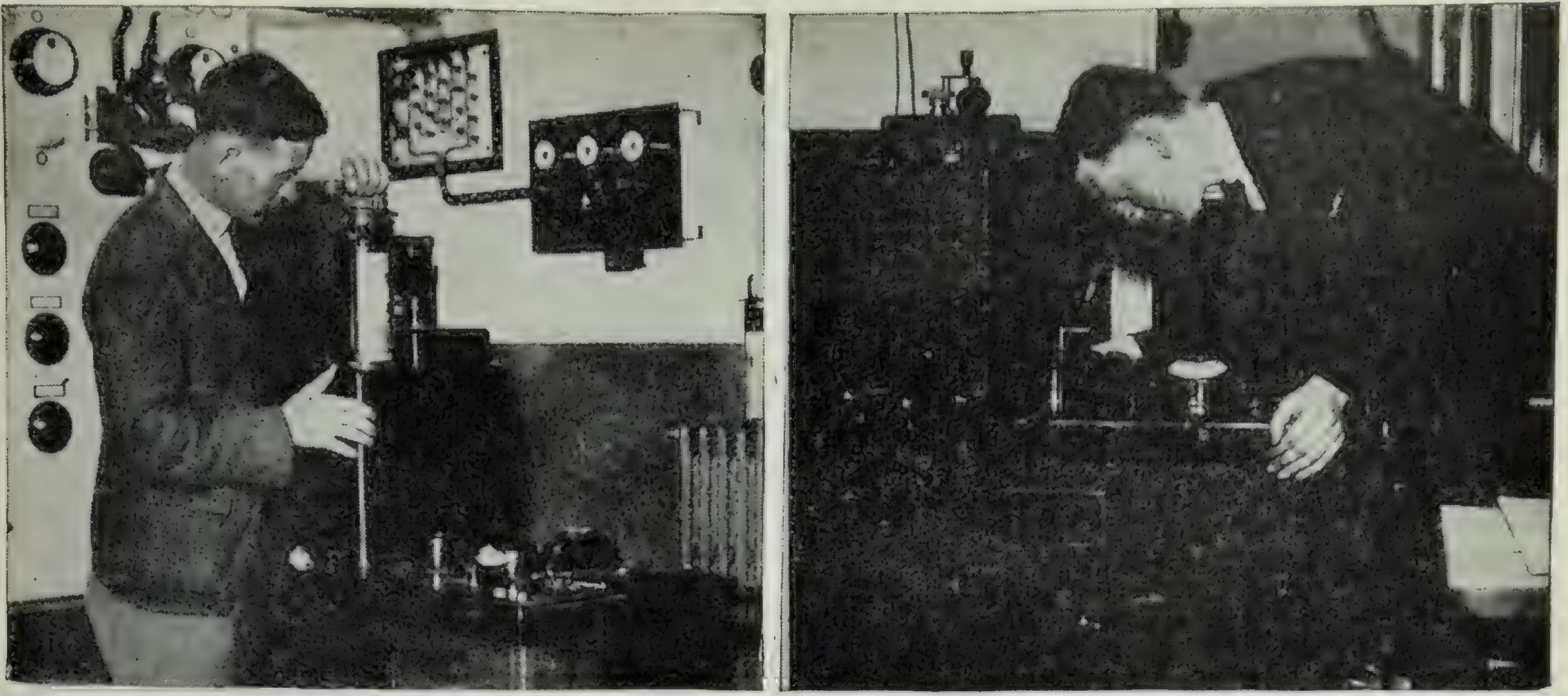


Have you ever thought how the pictures you see in a newspaper are printed ? They are printed from blocks that are made by photographic and other processes, and you will find these described elsewhere in this book. In the picture you see the giant cameras in the " Process Engraving Department," where blocks are made from photographs or sketches.

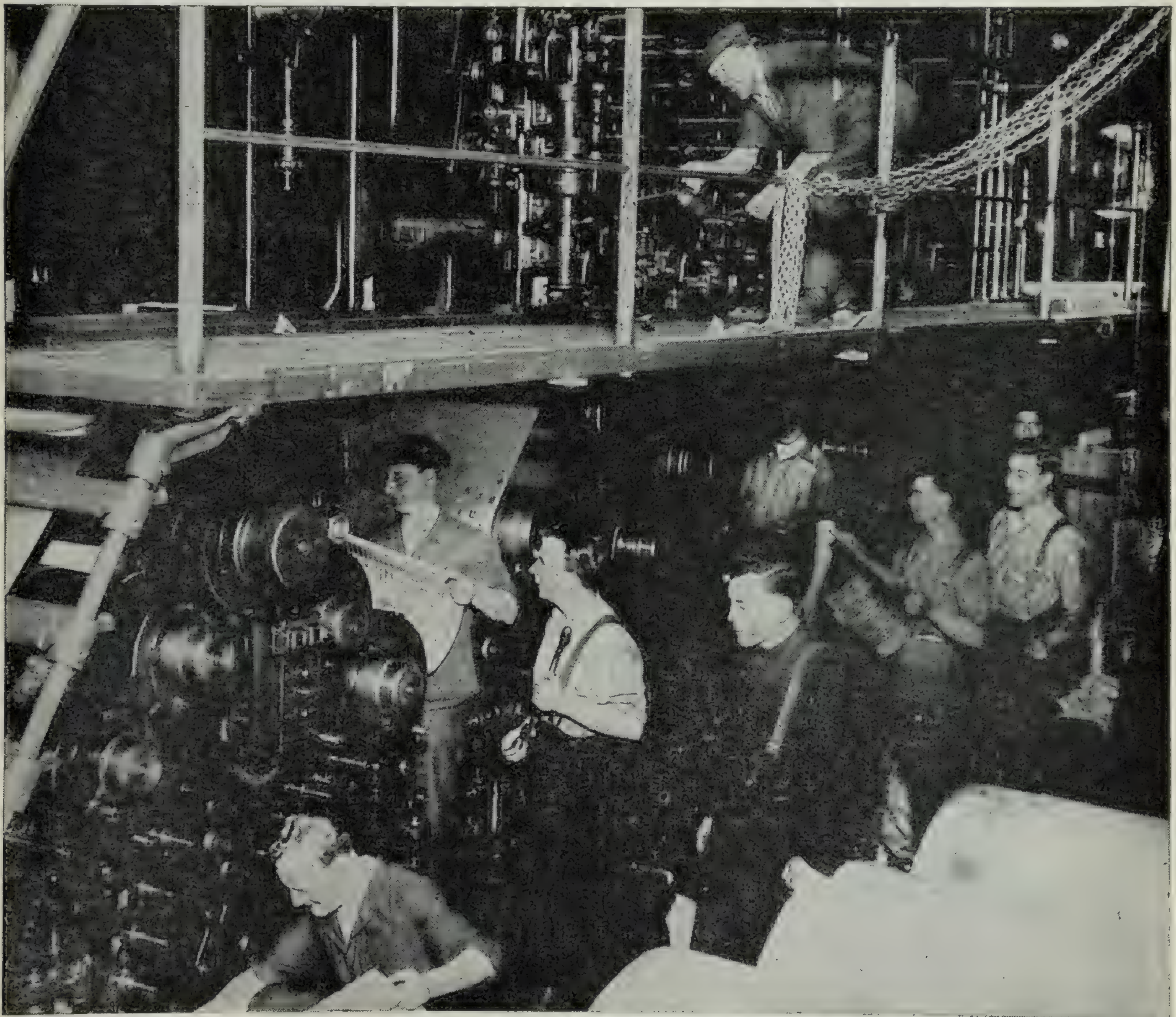


When you open your newspaper it is flat: but it is not printed flat. Our newspapers are printed from curved metal plates which are fitted to rotary machines—so called because the surface that prints on the paper rolls over it. Here the curved plates, two of which are seen on the left, are being made from molten metal, a mould or " impression " of dry flong being used. Strangely enough the molten lead does not burn the flong.

BUILDING A NEWSPAPER IS A BUSY JOB

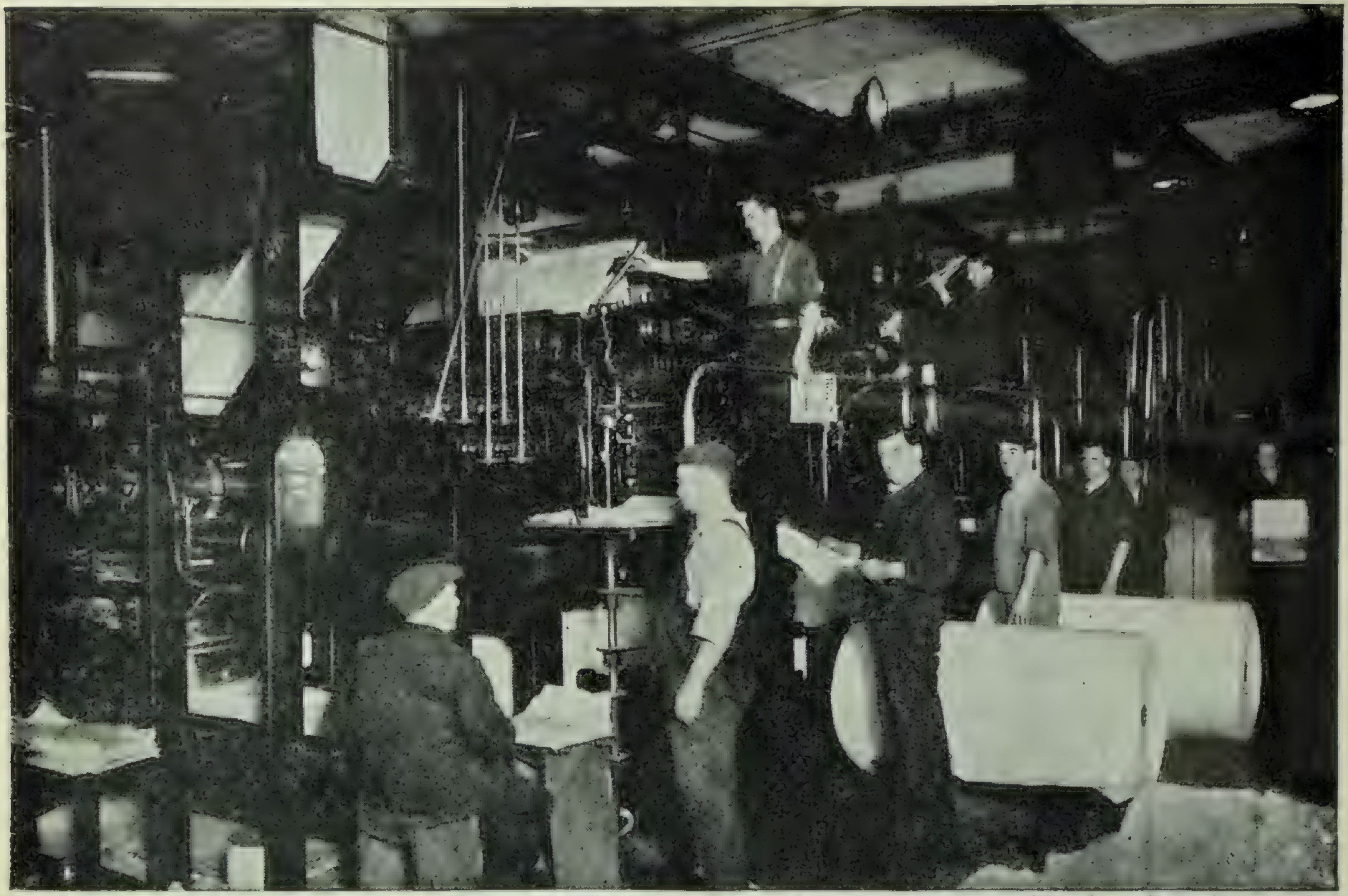


Newspapers can be printed in London and the provinces at the same time. Even photographs are sent by wire. The lights and shades of the photograph are changed into electric currents which vary as the light and shade on the picture vary. Here a photograph is being sent from London to Manchester "over the wire." Six minutes later the photograph is being received in Manchester. The currents are now changed back, giving the light and shade effects of the picture.



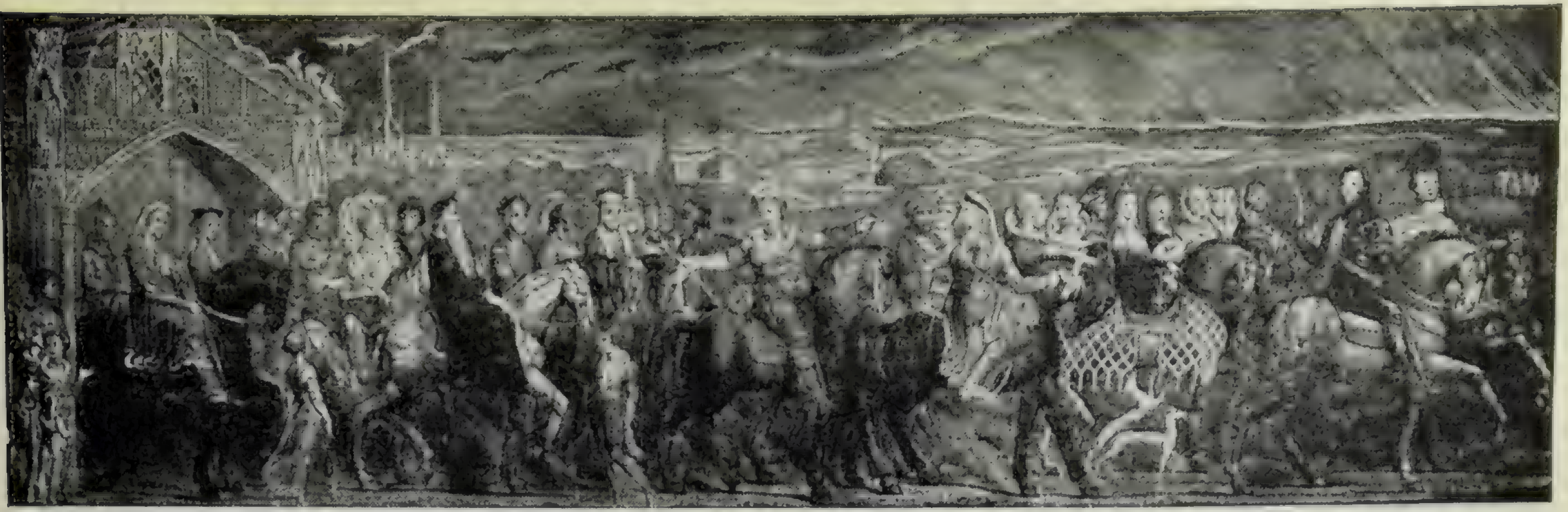
Just like the engine-room of a great liner! A miracle of intricate mechanism—the huge rotary presses that thunder and vibrate as they turn out every hour approximately 500,000 complete copies, cut, folded and counted, of a 16-page paper ready for delivery. Just think how many papers this amounts to every second!

HOW A NEWSPAPER COMES TO LIFE



Another view of a great rotary press. Before starting it up, the machine-men are seen oiling it to keep it in perfect condition for its "express run." On the right you will notice the huge rolls of paper with which it is fed. If unwound, these rolls would measure five miles in length. Tons of ink are used daily.

All the time we are sleeping, packers are arranging the papers as they come off the presses. They are then bundled and put on to motor vans and trains and carried at full speed to their destinations throughout the land, so that even if we live in the country we can have our newspaper every day by breakfast. This is a marvel of modern transport.



The jolly company of Pilgrims set out on the road to Canterbury, telling stories to enliven the journey.

OUR LITERATURE

It is so easy to obtain books to-day that we have forgotten to treasure them as our ancestors did. So few and precious were they in olden days, that Bibles were chained, so that they could be examined without being removed or damaged. Gradually, however, when printing came into existence, each book became less of a miracle, till to-day a rich store has been built up for us. We can dip into this store-house of learning, and by means of it into the lives of dwellers of the past, by merely turning over the pages. The fascinating story of literature, from the days when men had to struggle with rough script to make their words immortal, is told below, and will interest all to whom a book is not merely paper and print.

THE English people have not always been in England. When they came first to Britain, it was very different from what it is to-day. What is now rich English cornland or green meadow was in those far-off ages pathless swamp or tangled jungle. The pleasant English hills were then shaggy with untrodden forest. And through these forests and jungles roamed Early Man.

So far as this country is concerned, history really begins with the famous Roman conqueror, Julius Cæsar, who arrived with his legions just two thousand years ago. For five hundred years Britain, by which we mean England and what are now the Lowlands of Scotland, was a part of the great Roman Empire.

When the Roman Empire fell into decay, Britain, as an outlying part of it, was one of the first portions to go, and the poor Britons, thus left unarmed and helpless, fell an easy prey to the wild northern tribes. In despair they turned to a race of sea-rovers, the English, of whom they had for long been greatly afraid, but whom they now begged to save them from the dreadful Caledonians. The English were quite willing to come and help them, and did so.

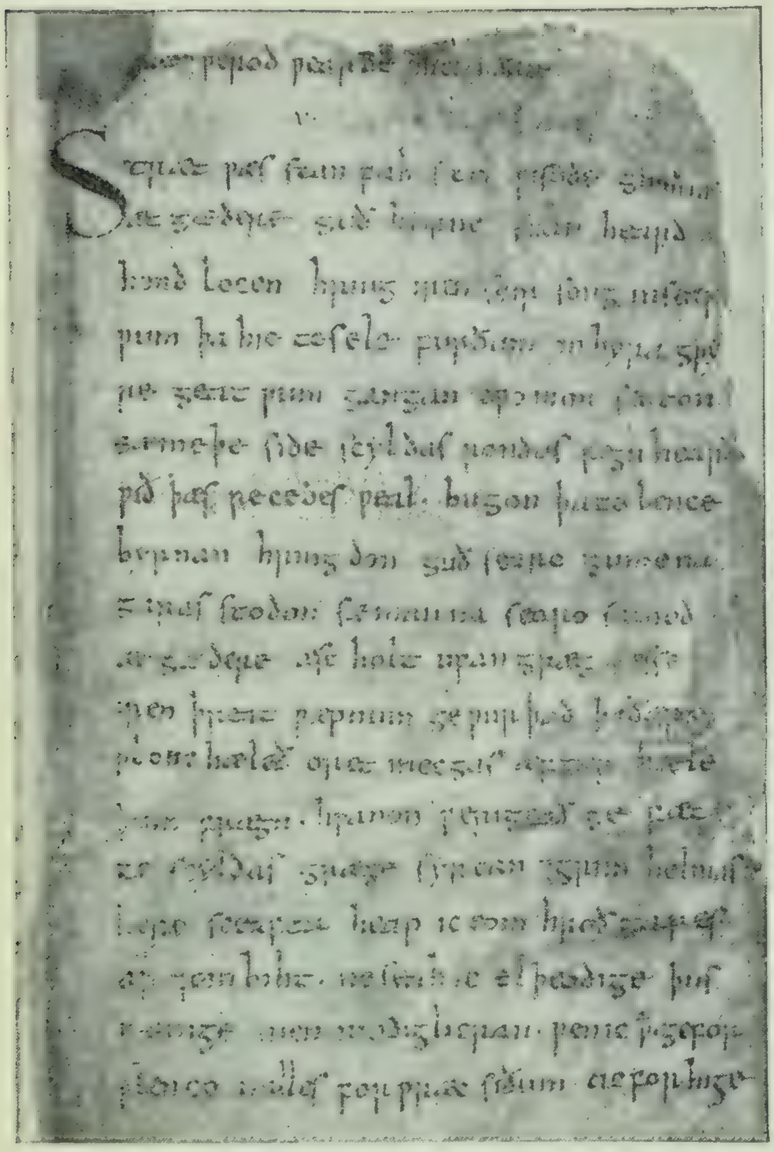
But having driven out the rude Caledonians, they looked upon the land and saw it was very fair. Instead of going back to their own home, they settled in the best portions of the land and pushed the Britons farther and farther into the barren and hilly regions of the north and west. Then, in their turn, the English settled down to be a peaceful, hard-working and civilised race.

After four or five hundred years, however, the English had to suffer the same fate as that which they had meted out to the early Britons. In the year 1066 England was invaded by a foreign race, for the Normans, under William the Conqueror, landed near Hastings, and very quickly the whole country came under their rule.

The results of the Norman invasion were of great importance in the growth of the English. For instance, the people no longer used their strange old German language in its pure state ; in every sentence they used Norman words as well. But far more important than this was the breaking down of old customs and the introduction of new ones.

SINCE the English came from Germany they naturally spoke an ancient kind of German language, which is now called Old English or Anglo-Saxon. It is the forerunner of modern English, though you would hardly recognise it. Yet, in spite of all differences, the Old English language remains the parent of our modern speech.

Almost the first event to bring important ideas to the Old English was the coming of Christianity. This was not only a change of worship ; it was a change of mind, for the ideas



The earliest contribution to English literature was an epic poem, *Beowulf*, probably the work of many poets. A page from an old manuscript copy, in curious writing, is seen above. Can you read any of the words?

of Christianity are very different from those of heathendom. So we had the first great flooding-in of new ideas (which meant the making of new words), into the simple life of the Old English.

After the coming of Christianity in the sixth century, the next great event was the Norman Conquest, which took place in the eleventh century.

HOW THE ENGLISH LANGUAGE WAS VERY NEARLY LOST.

The Normans came from the north of France, and spoke a kind of French which was mixed with many northern words. They quickly subdued the English armies and settled themselves in England. England was conquered and for two or three hundred years it appeared likely that the English language would be conquered too. But this did not happen. Hundreds of thousands of Englishmen continued to live their old lives, and speak their old language, in spite of what the Normans did or tried to do, and English remained the language of the country. But no other event has altered the English language so much as did the Norman Conquest and its after-effects.

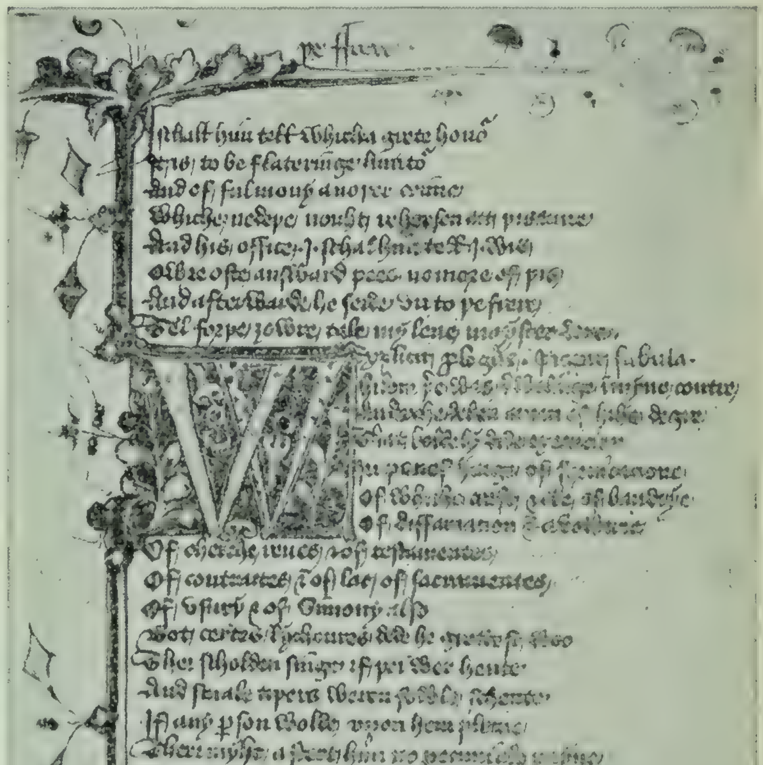
After the Norman Conquest there came a period of several hundred years, during which all Europe seemed to have fallen into a kind of sleep. There was little new learning and hardly any advance in science or the arts. This period is called *The Dark Ages*.

Then gradually there came signs of a fresh awakening, called the *Renaissance*. It began about the fourteenth century, and reached its highest point about the sixteenth. In England its best results were seen during the reign of Queen Elizabeth. A host of new Latin and Greek words came streaming into English speech.

These three great events—the coming of Christianity, the Norman Conquest, and the effect of the Renaissance—are the most important in the history of the English tongue. But since the times of the Renaissance many languages have added words to English speech, till nowadays we have one of the richest in the world.

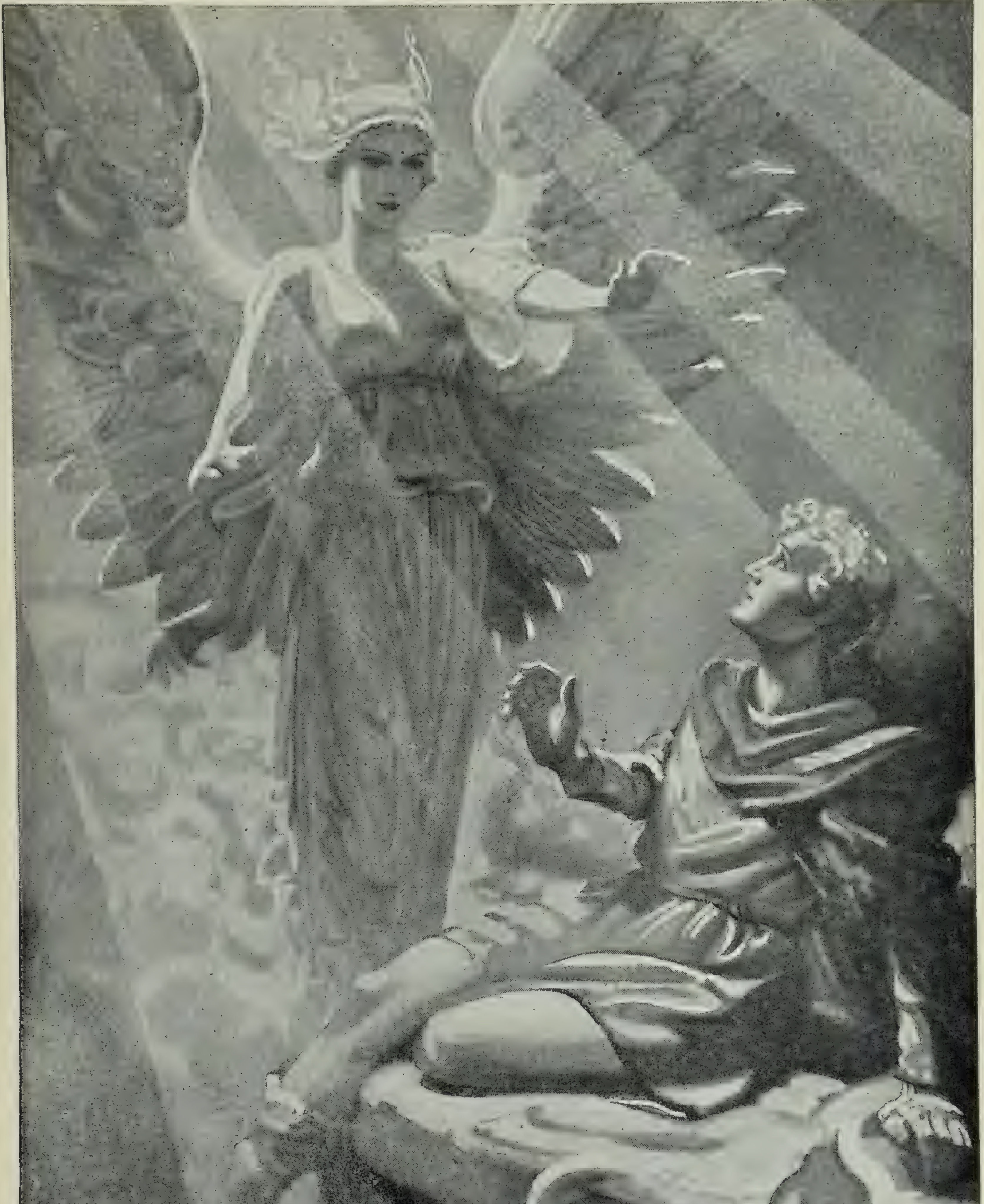
THE EARLIEST POEM TELLS A WONDERFUL STORY THAT IS ALMOST LIKE A FAIRY TALE.

Earliest of all written English literature is the epic poem of *Beowulf*. Though the existing manuscript dates from about A.D. 1000 the poem may have been written much earlier,

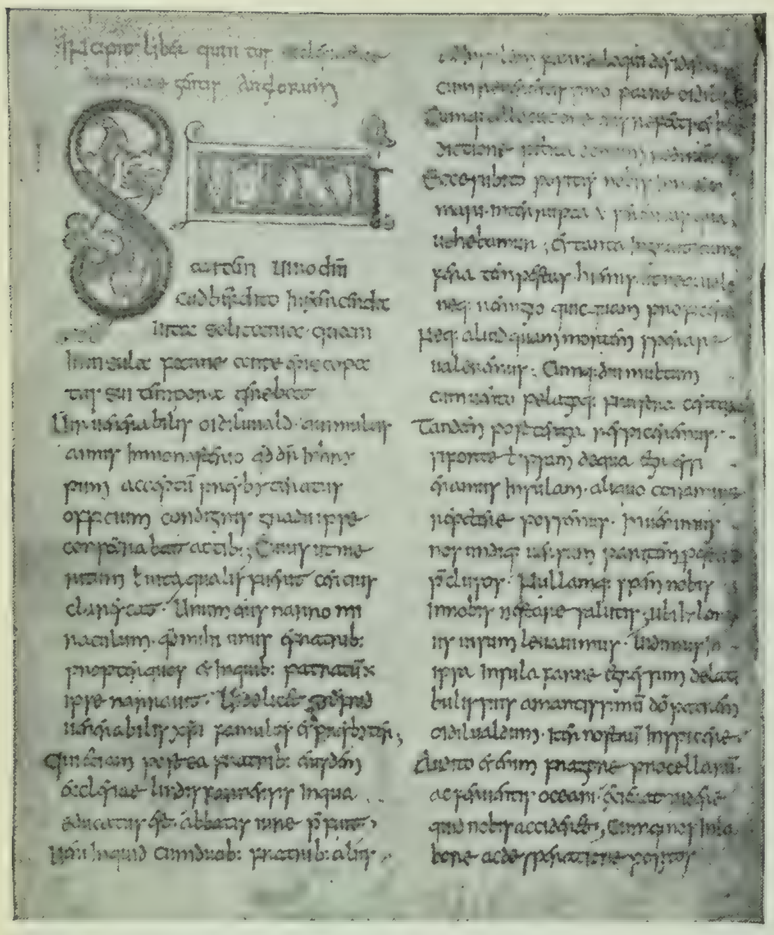


Have you read the tale told by the Jolly Friar on the way to Canterbury? Part of his story, from the MS. of Chaucer's *Canterbury Tales*, is reproduced in the picture.

THE ANGEL AND THE WHITBY COWHERD



Caedmon, cowherd at the Abbey of Whitby, sat alone in the eventide. Suddenly an angel appeared to him in a vision and bade him write of the "beginning of created things." Inspired by the vision, he wrote his "Paraphrase," a poem telling of the creation of the world by God, and because of this he is regarded as our first English poet.



Bede—known as the venerable Bede—was the first English historian. This seventh century priest wrote many works, including an Ecclesiastical History, a page of which is seen above. Note how neat the writing is.

perhaps even several centuries earlier. It is in the Anglo-Saxon tongue and deals with the exploits of a hero named Beowulf, nephew of Hygelac, King of the Geats, or Gatar, a Scandinavian people.

Some incidents of the poem seem to be genuine history. Others are perhaps traditions of the ancient bards. Others, again, such as Beowulf's fights with the monster Grendel and the dragon, are myths, tales based on the old pagan beliefs of the people. It is a wonderful relic of Anglo-Saxon literature.

HOW A VISION INSPIRED A SIMPLE HERDSMAN, WHO BECAME THE FIRST ENGLISH POET.

We must remember, however, that Beowulf was probably a composite work of many poets. Caedmon, who lived in the seventh century, was in a truer sense the first English poet. While he was still a simple herdsman he had a vision in which someone commanded him to sing. "What shall I sing?" asked Caedmon. "Sing the beginning of created things," said the vision, and Caedmon found himself making up wonderful poetry which, strange to say, he remembered on waking.

Those to whom he told his vision led him to Whitby monastery, where the Abbess Hilda, struck by his genius, helped him to become a monk. The rest of his life was spent in turning parts of the Bible into poetry. Among the poems of Caedmon which remain to us is a part of the Hymn inspired by his famous vision.

If Caedmon was the first English poet, the venerable Bede (who told us all that we know about Caedmon) was the first English historian. He, too, lived partly in the seventh century (from about 672 to 735). He was a priest at the monastery of Wearmouth, and, like Caedmon, spent his time in studying the Scriptures.

Bede's best known work is his *Ecclesiastical History*, but he also wrote a number of other works, including a *History of the Abbots*. He was a gentle, pious priest and a great historian, and as learned a scholar as any of his day. His last hours were spent in dictating an English translation of the Gospel of St. John.

HOW A GROUP OF MEN AND WOMEN WENT ON A PILGRIMAGE.

In the days of our forefathers people did not go off to spend holidays in the way we do now. But to make up for the lack of holidays they went on *pilgrimages*. They went on journeys to some place famous for its holiness. It is one of these pilgrimages—perhaps the most famous pilgrimage ever made in England—that we are now to describe to you.

The pilgrims met at Southwark, at an inn called the Tabard. We know the exact number of pilgrims, which was nine-and-twenty. We do not know the exact date, but it must have been about the year 1380, when the young Richard II. was King of England.

The Tabard Inn was a jolly place. Its doors stood open, giving admittance to the airy well-swept rooms. The food, too, was excellent. The host, Harry Bailey by name, was the soul of good cheer. No wonder those nine-and-twenty pilgrims were well satisfied with their lot. In themselves the pilgrims were an interesting group of English men and women. They included nearly all ranks of society, beginning with a knight and finishing with a ploughman.

There was the knight, for instance. He was an oldish man, rather gray, and weary with many wars. His son was there too, serving as a squire to his father.

A COMPANY OF TWENTY-NINE SET OUT TOGETHER FOR CANTERBURY.

Among the pilgrims the most numerous group was that of the churchmen. Though they numbered nearly a dozen, there was only one whom you would really like. He was a poor parson of a country parish, a man who worked hard, teaching and preaching the love of Christ and his twelve apostles, and, what is perhaps more important, he set a good example by first following Christ's teaching himself.

One of the wealthiest pilgrims was a monk. He paid no attention to his duties, but rode about, hunting and enjoying himself; and there were other and still worse types of churchmen. Let us turn from such people to look upon Madame Eglantine, the prioress, a refined and tender-hearted churchwoman, the head of a large nunnery.

One of the funniest characters is that of a wife who lived near the town of Bath. Dressed in the latest fashion, she was full of jokes and laughter, and could outface all the men with her bantering replies.

If you had been one of the nine-and-twenty, you might never have noticed a shy, little man, rather white-haired and inclined to be stout. He said very little, but his keen, gray eyes was very busy.

MINE HOST HITS ON A GOOD PLAN FOR ENLIVENING THE JOURNEY.

It is he who has written about them all in his book, called the *Canterbury Tales*. His name is Geoffrey Chaucer. He has made the pilgrims as real as living men and women.

After supper the landlord of the Tabard Inn, Harry Bailey, thought of a plan by which he might cheer them up during the journey.

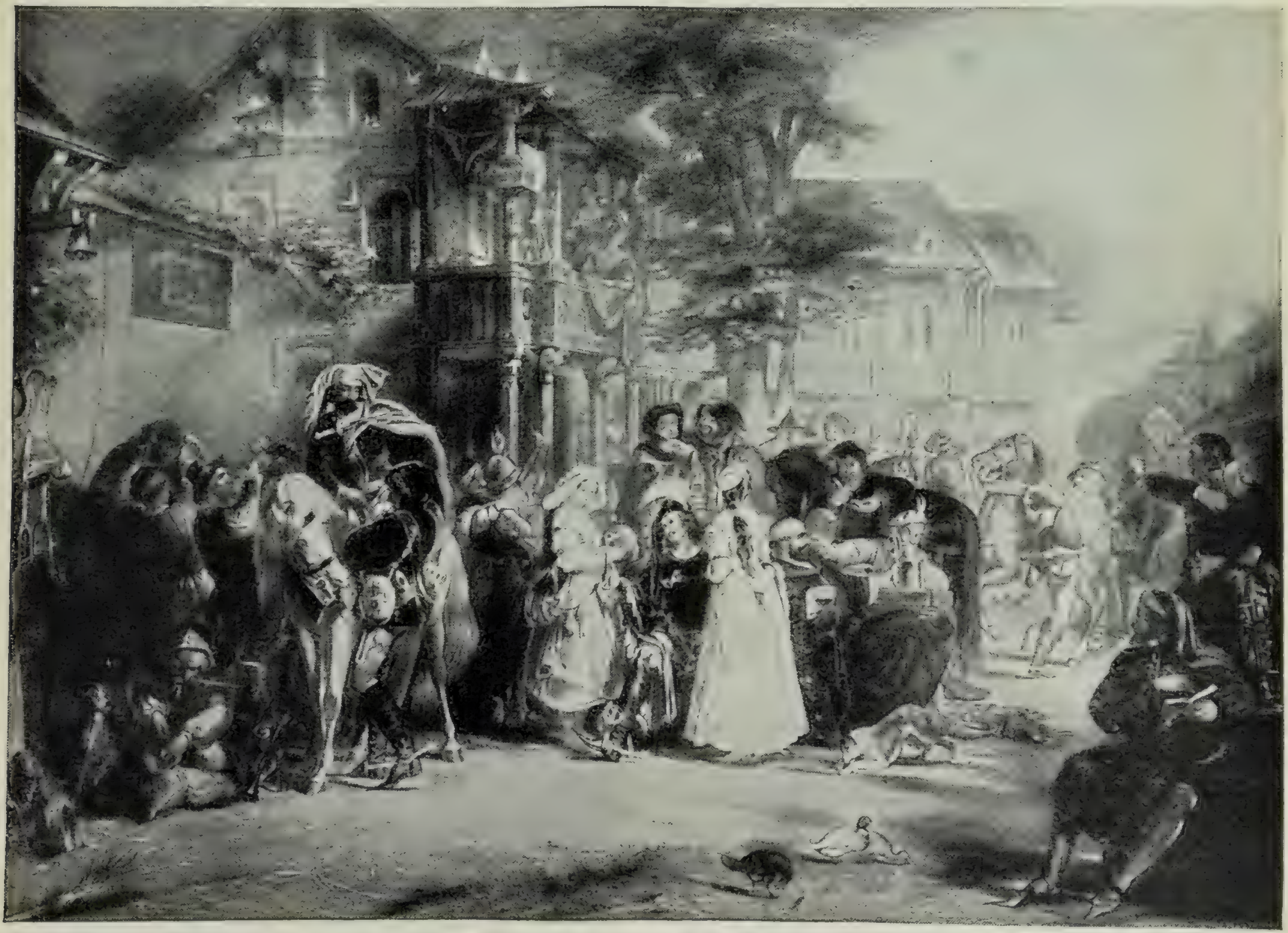
"I suggest," said he, "that each of us tells two stories on the way to Canterbury, and two stories coming back. I shall judge who tells the best story, and he shall have a dinner at our expense."

TWENTY STORIES ARE TOLD IN THE FASCINATING CANTERBURY TALES.

His plan was at once agreed to; and so the next morning they began the long list of stories, both in prose and verse, known as the *Canterbury Tales*.

We do not know how the pilgrimage ended, for Chaucer never finished his *Canterbury Tales*. Only about twenty were written; but these are enough to let us see how large, how kindly, and how good-humoured was the spirit of Geoffrey Chaucer.

It is usually thought to be a childish thing to believe in fairies. Yet one of the wisest and most serious of English poets, called Edmund Spenser, wrote his longest poem about fairies.



The Canterbury Pilgrims arrive at the Tabard Inn, a hostelry at Southwark that was famed for its good cheer. If you have already read the fascinating tales spun on their travels, you will recognise the different Pilgrims in the picture.

Edmund Spenser, the early English poet, whose fascinating allegory, *The Faerie Queene*, has been handed down through many centuries as a triumph of writing.

He called it *The Faerie Queene*, a poem which is considered to be among the finest of the longer poems in our language.

It is certainly a very long poem, but Spenser intended it to be longer still. *The Faerie Queene* was to consist of twelve books. Each book is divided into twelve cantos or sections; each canto consists of about fifty verses; and each verse of nine lines. But it was never finished; and the story of this incomplete poem is one of the saddest in English literature.

HOW THE IRISH REBELS PUT SPENSER'S LIFE IN DANGER.

Spenser's life began happily enough. After he left Cambridge he was given an important post under Lord Grey of Wilton, who was then Governor of Ireland. Here Spenser lived for nearly twenty years at Kilcolman Castle. On the whole they were happy years, in spite of constant danger from the Irish rebels. The poet, when he was not busy with his other duties, kept steadily at his great poem, and it grew rapidly. In 1590 the first three books—the first quarter of the poem—were printed; five years later he returned to London to see the second three books published; and then, three years later, in 1598, the crash came.

The Irish rose in rebellion. Fire and sword were carried through the country. His castle at Kilcolman was sacked and burnt, and one of his children perished in the flames. Spenser fled to London, a ruined man. He died a year later, it is said, from lack of bread. Such was the unhappy end of the poet of *The Faerie Queene*.

WHAT KIND OF POEM IS AN ALLEGORY? HAVE YOU READ ONE?

Spenser's poem is what is called an *allegory*. He used fairies only as a cloak to cover what he wanted to say about other things. Here is the plan of it:

You have to imagine twelve knights of fairyland, each knight standing for some great virtue, and each taking up one book of the poem. For example, in Book I. you read about the Red Cross Knight, who stands for Holiness. All these knights, who have the most marvellous adventures, are under the command of King Arthur, who was to marry the Fairy Queen, Gloriana.

This was not all the allegory, however. It is easy to see that the poem is largely intended to be a piece of flattery offered to Queen Elizabeth who is the Queen of Fairyland, Gloriana herself.

Spenser had such a strong imagination, and such a gift of writing beautiful and sweetly sounding poetry, that *The Faerie Queene* is one of the most delightful of English poems.

THE WANDERING MINSTREL SUPPLIED ENTERTAINMENT IN THE OLD DAYS.

When you go to a good modern theatre, you find that everything has a bright and pleasing effect on you. Yet, as you behold this finished work of the modern theatre, you should give a passing thought to the humble beginnings which made this possible.

If we go back more than a thousand years in our history, we find that grown-up people

William Shakespeare, the Stratford playwright and poet, the greatest dramatist the world has ever known. His Comedies, Tragedies and Historical Plays are still popular.

were more childlike in their ways than they are nowadays, and their natural longing for amusement was much more easily satisfied. To some extent this want was supplied by the wandering minstrels. The minstrel, however, though he was a useful and delightful person, did not satisfy the people who wanted to sing and act for themselves. People of this kind never ceased trying to find an outlet, and they found it in the services of the church.

Sometimes little incidents were introduced into the mass at suitable times of the year. For example, at Easter-time a short scene was acted, showing the angel at the tomb of Jesus. In the course of time the priests began to keep the acted scenes apart from the proper mass, and to have little dramatic performances of their own. These performances were called *Mysteries*, and they are the earliest of all English dramas.

IN OLDEN DAYS MIRACLE-PLAYS WERE VERY POPULAR.

Mysteries were so called because they showed divine events which were beyond the understanding of men. Out of the Mysteries grew another kind of play called the *Miracle-play*.

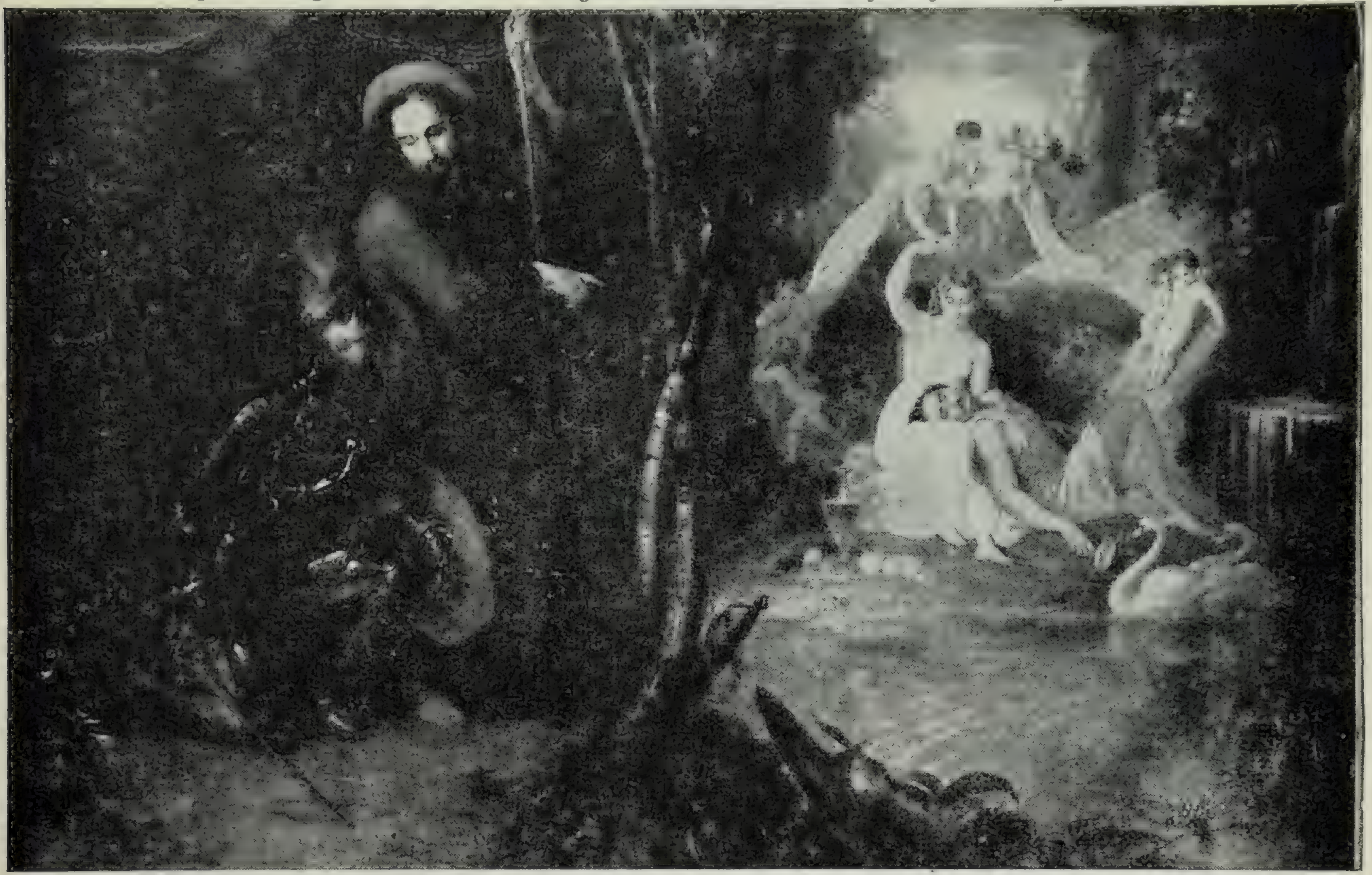
Next, from the mystery-play and miracle-play combined, grew a very important kind of drama called the *morality-play*. The subject of a morality-play was usually drawn from everyday life, the characters were named after virtues and vices, and the story usually laid down some great moral truth.

The characters, in spite of their unreal names, are sometimes really human in the way they behave. In this we see the beginnings of the drama as we know it. It is now no more than a single step to the plays of Shakespeare.

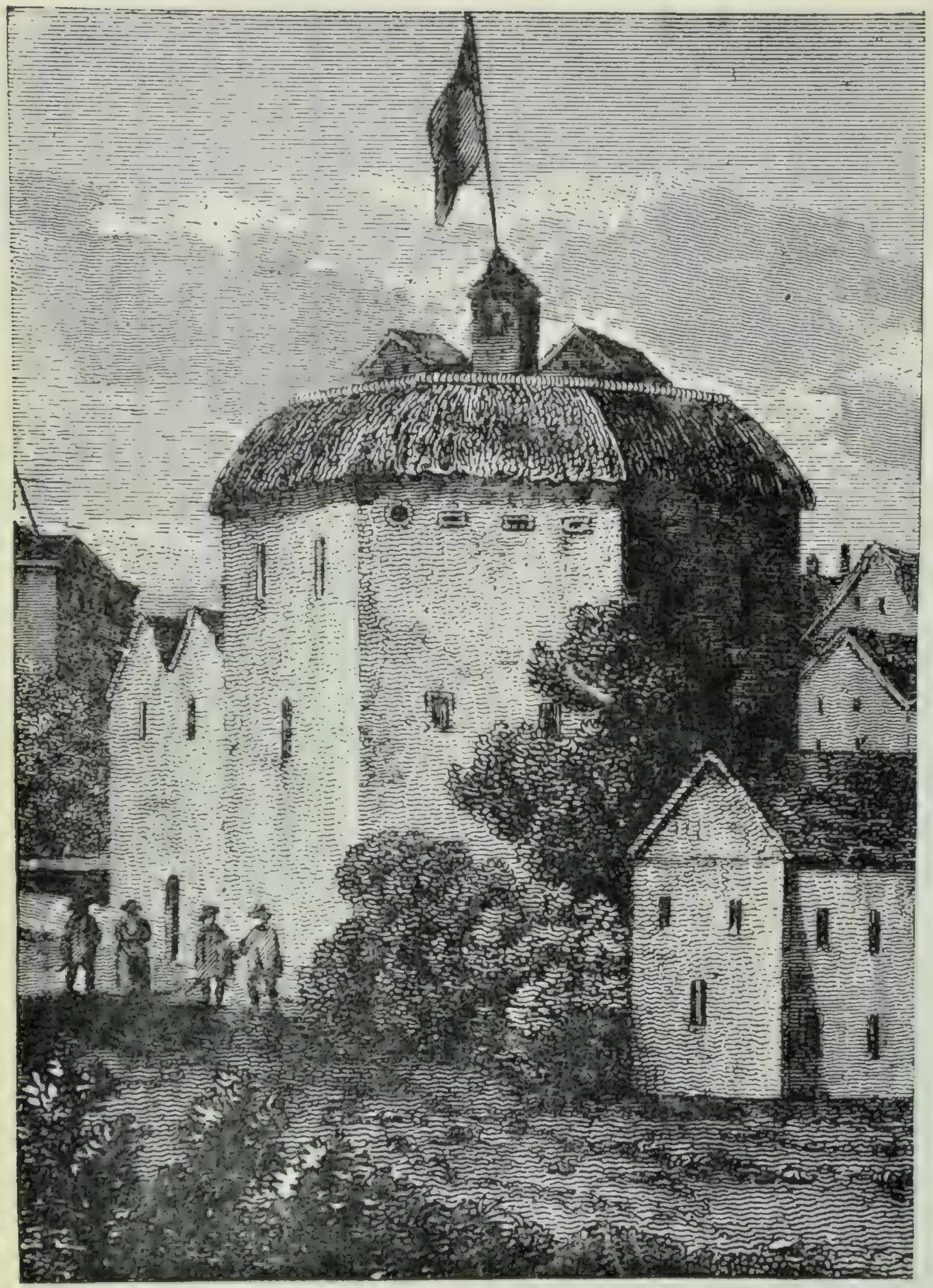
WHY DO WE NOT KNOW THE DATE OF SHAKESPEARE'S BIRTH?

On the 26th of April, 1564, in the parish church of Stratford in the county of Warwick, a baby boy was baptised by the name of William Shakespeare. In those days it was the custom to baptise children on the third day after they were born; so it is likely, though by no means certain, that William Shakespeare was born on 23rd April. This happens to be the day that he died, in the year 1616; so perhaps Shakespeare died upon his birthday.

It should always be remembered that we do not really know the day of Shakespeare's birth though we know of his baptism; and this lack of knowledge applies to nearly every other stage of Shakespeare's career. It is one of the greatest puzzles in our literature that the life of our most famous poet has remained largely a mystery to those who came after him.



Spenser's extremely long poem, *The Faerie Queene*, has an underlying double meaning. The scene above pictured shows the brave knight, Sir Guyon, about to rescue Verdant from the toils of the enchantress Acrasia. *The Faerie Queene* has been spoken of as "link'd sweetness long drawn out."



The Globe Theatre, where in olden days so many of Shakespeare's plays were performed, was burned to the ground during the playing of *Henry VIII.* An engraving made about 1612 is reproduced above.

Shakespeare probably had little book learning; but he had a very quick eye, a very strong memory, and a tremendous interest in the life of everything and everybody around him. No single writer has ever equalled Shakespeare in his wide and wise outlook upon all kinds of life.

SHAKESPEARE JOINS A BAND OF STROLLING PLAYERS, ROAMING THE COUNTRY WITH THEM.

While he was still at Stratford, and at the early age of eighteen, he married Anne Hathaway. If you go to Stratford you will see the quaint cottage which is called after her. Two years after his marriage Shakespeare left Stratford suddenly, and probably joined a band of strolling players. Then, about the year 1592, he began to appear as a poet and playwriter. He was also an actor, but never a great one. His principal parts were written for other actors, and he had the sense to see that the big parts were not for himself.

He had a prosperous career in London. Most of his fortune came from his plays, which he wrote at great speed for a company of actors with which he was connected.

Shakespeare also added greatly to his income by his profits from the London theatres of which he was part-owner. One of these, the Globe, was burned down during the performance of *Henry VIII.*, one of his own plays.

This disaster came too late, fortunately, to make much difference to Shakespeare. It is almost certain that he spent the latter years of his life in his native town, enjoying the ease and good name he had earned so well.

If you go to visit the parish church of Stratford you will find his grave in front of the altar.

Shakespeare wrote some thirty-seven plays, as well as two very long poems and 154 little poems of fourteen lines each, called *sonnets.*

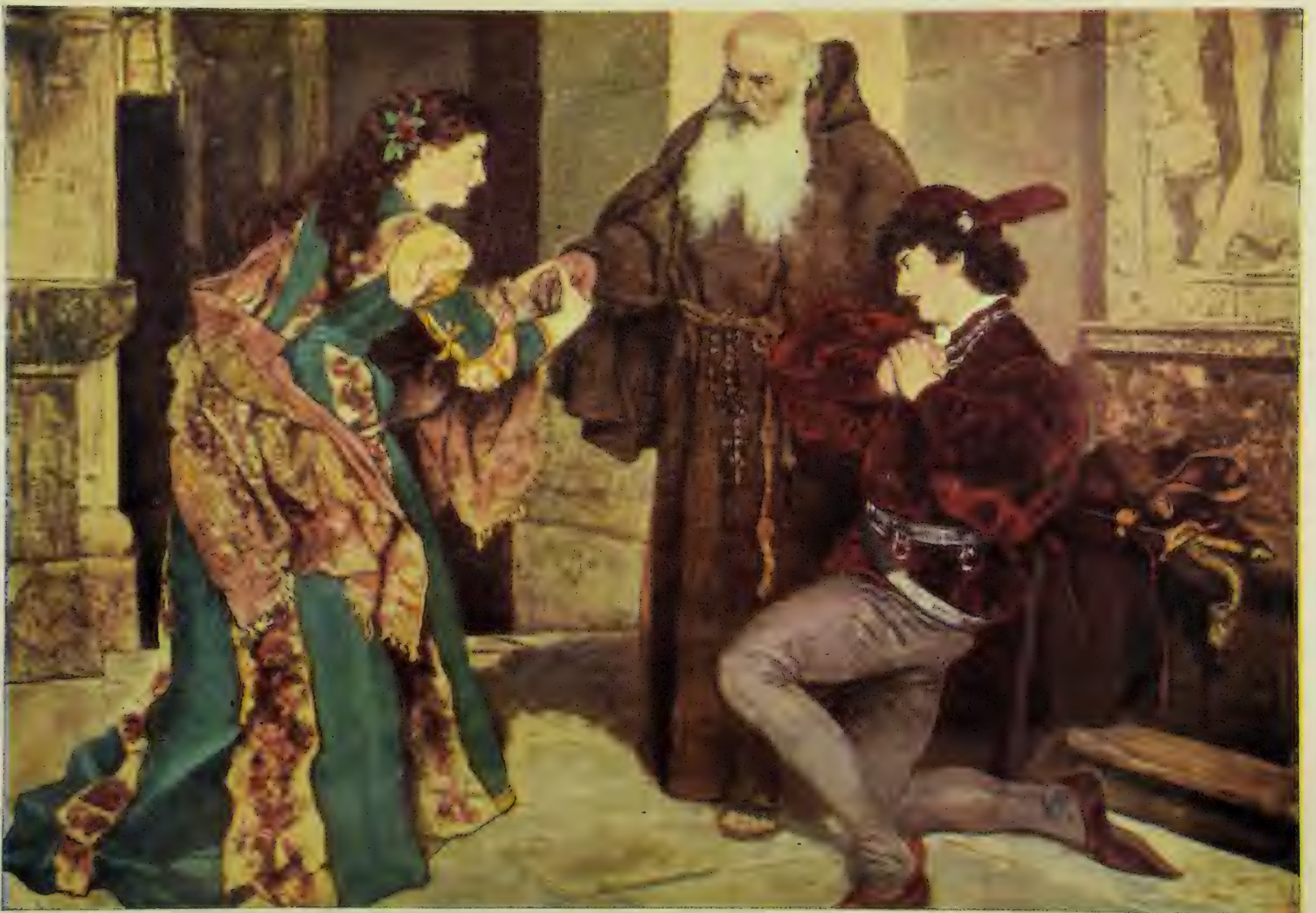
His plays were sometimes grave and sad, and sometimes jolly and amusing. There were seventeen jolly ones, or *comedies*, and ten sad ones, or *tragedies*. He also wrote ten historical plays.

His *Merchant of Venice* is well known to children, as are *As You Like It, Midsummer Night's Dream* and *The Tempest.*

The Tempest was his last play, and in some ways is his most perfect. Somehow we feel that old Prospero, in the play, is Shakespeare himself, ready to lay down his pen and retire to his Stratford home.

Prospero says in the last act of the play :

Ye elves of hills, brooks, standing lakes, and
    groves ;
And ye that on the sands with printless foot
Do chase the ebbing Neptune, and do fly him
When he comes back ; you demi-puppets that
By moonshine do the green sour ringlets make,
Where of the ewe not bites ; and you whose
    pastime
Is to make midnight mushrooms, that rejoice
To hear the solemn curfew ; by whose aid,—



ROMEO AND JULIET.

The tragic romance of Romeo and Juliet immortalised by Shakespeare in his play of that name stands out as the finest love story told by any playwright. In the picture

Weak masters though ye be,—I have bedimm'd
The noontide sun, call'd forth the mutinous winds,
And 'twixt the green sea and the azured vault
Set roaring war: to the dread rattling thunder
Have I given fire, and rifted Jove's stout oak
With his own bolt: the strong-based promontory
Have I made shake: and by the spurs pluck'd up
The pine and cedar: graves, at my command,
Have waked their sleepers, oped, and let them forth
By my so potent art. But this rough magic
I here abjure: and, when I have required
Some heavenly music,—which even now I do,
To work mine end upon their senses, that
This airy charm is for, I'll break my staff,
Bury it certain fathoms in the earth,
And deeper than did ever plummet sound
I'll drown my book."

When we read the plays of Shakespeare we realise that he, like Prospero, commanded all kinds of characters, human and fairy, and made them do his bidding.

WHO WERE THE PURITANS AND WHO WAS THEIR LEADER ?

You have all heard of the Puritans. They began to be known during the reign of Queen Elizabeth; in the next reign, that of James I., they became more numerous; in the next, that of Charles I., the Puritans were so strong and stubborn that they rose against Charles, defeated him, and finally executed him in the year 1649.

By their enemies the Puritans were said to be narrow-minded and deceitful men, but the best Puritans were high-minded and sincere. Moreover, from among the Puritans arose the most lofty and sincere of our poets, John Milton.

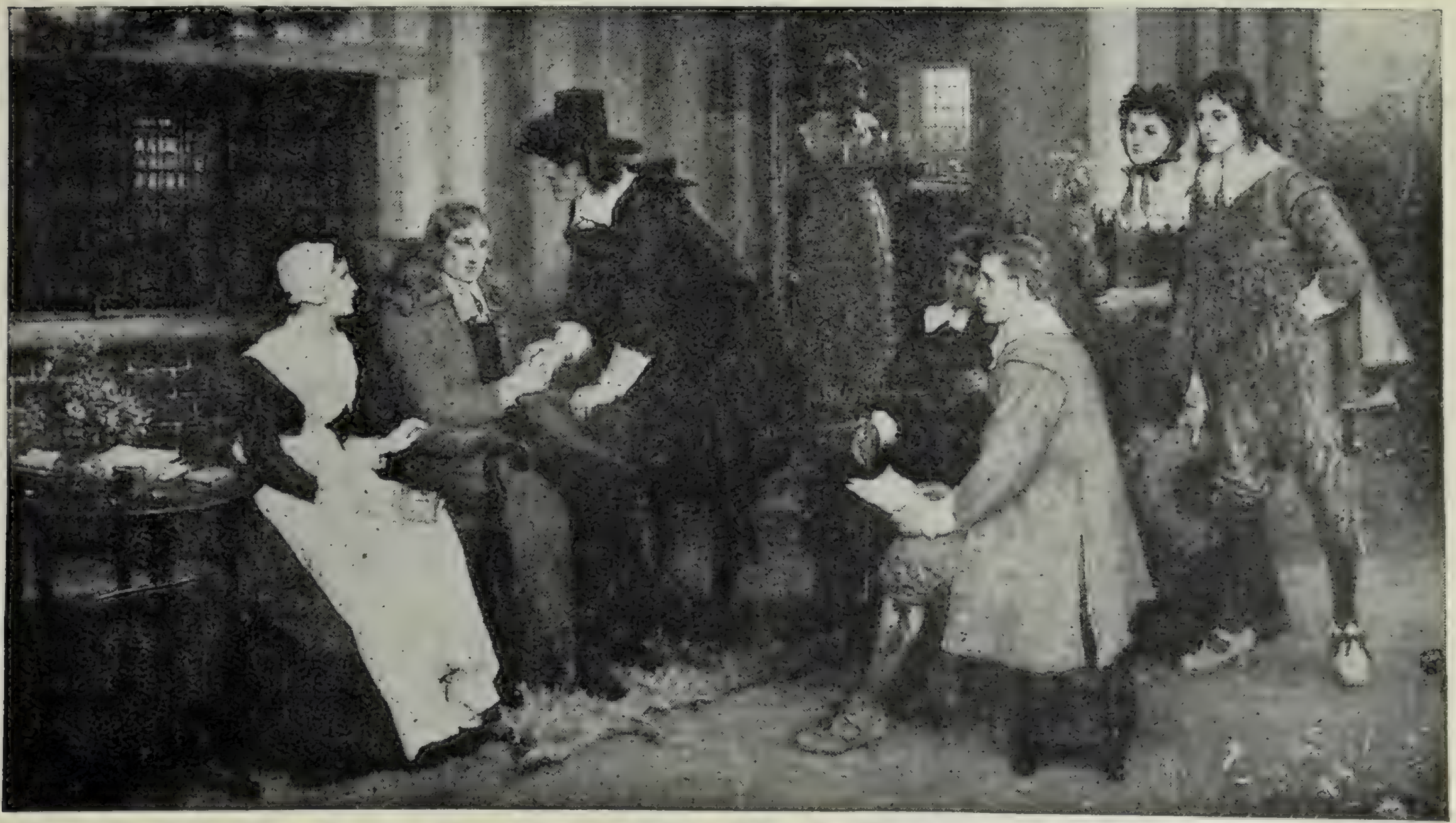
After Charles I. was executed, Oliver Cromwell became the leader of the Puritans, and founded the Commonwealth Government. Milton, already famous as a Latin scholar, became his secretary.

HOW MILTON LOST HIS HEALTH AND HIS SIGHT, AND MOST OF HIS FRIENDS.

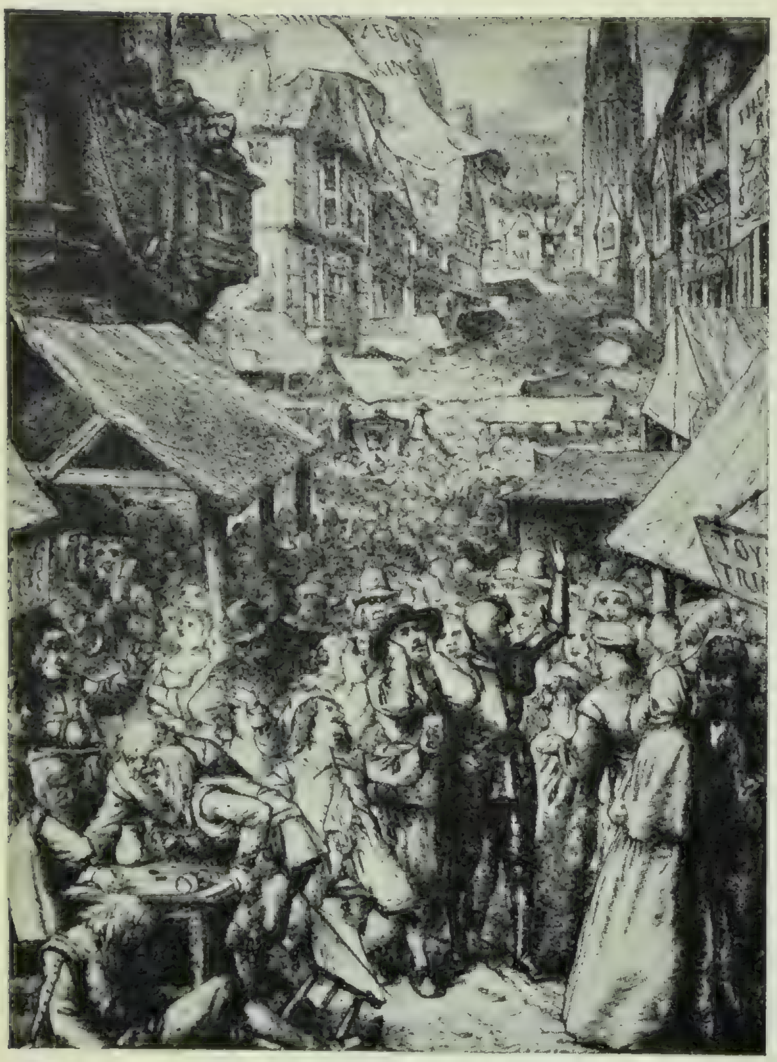
For over ten years Milton laboured in the Puritan cause. Then his health and eyesight began to fail, and by 1660, when the Puritans' cause received its death-blow, he was almost totally blind.

This was a dreadful time for Milton. People were now weary of the Puritans and their strict rule, and turned eagerly to welcome back Charles II., who landed at Dover on the 29th of May, 1660, amid wild rejoicings.

Milton lost his post; in fact, he all but lost his life. He was poor, friendless and blind. But the stern Puritan spirit upbore him, and he settled down to compose some of the greatest poems in the English tongue.



When Milton's health and eyesight began to fail, Andrew Marvell, a Yorkshire poet, came to his aid and acted as his secretary and general helpmate. The meeting of the blind poet and Marvell is shown in the picture.



Have you read *The Pilgrim's Progress*, by John Bunyan? If so, you will recognise Christian and Faithful arriving at Vanity Fair on their journey.

His worst troubles lay in his own family. His three daughters grumbled about the hard work of reading to their father, and they would not take his advice in anything.

In 1663, Milton married for a third time and for the rest of his life he worked in peace at those poems which for so long had been in his mind.

Thus we have his long poem about Adam and Eve, which is called *Paradise Lost*, the best long poem in English. He also wrote *Paradise Regained*, to show how men were saved by the coming of Jesus. Last of all came the great drama about Samson, who, like himself, was poor, blind, and tormented by his enemies.

HOW A POOR TINKER ROSE TO FAME AND BECAME A GREAT PREACHER.

You have heard about the long poetical allegory called *The Faerie Queene*, written by Edmund Spenser. We shall now speak about the finest English allegory in prose. It is called *The Pilgrim's Progress*, and was written by John Bunyan.

Bunyan's father was a Bedford tinker or tinsmith, and he, too, became a tinker, for in those days the trade passed from father to son. When he was still a young man he took part in the Civil War, siding with the Puritans against the Royalists of Charles I. It was whilst he was in the army that he was tormented with terrible struggles in his soul. He began to fear even that his sins would destroy him.

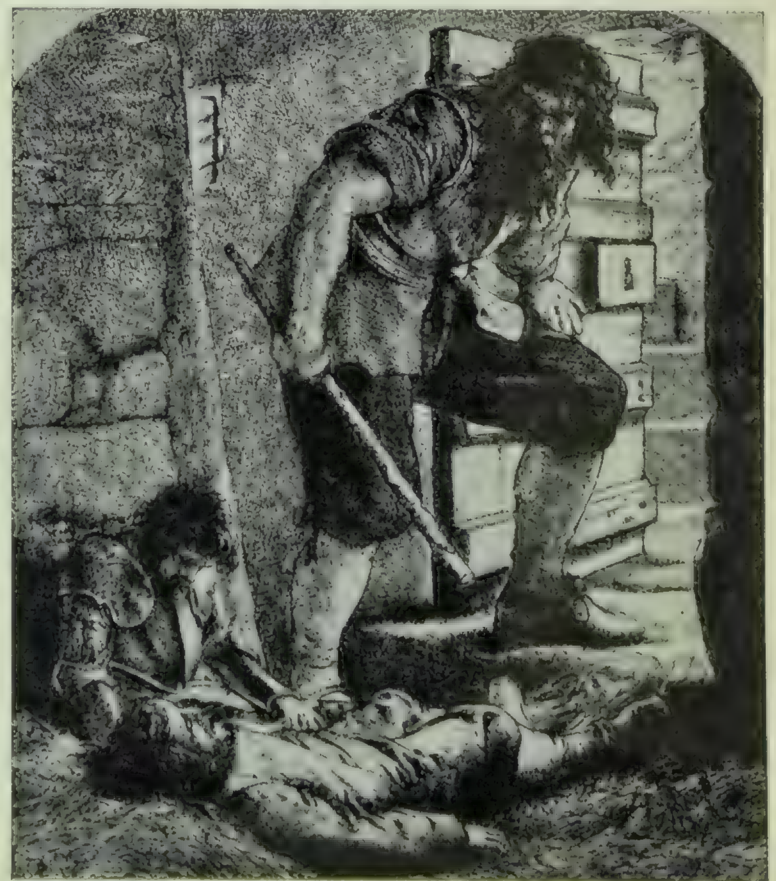
Yet he struggled through to the blessed light beyond. He became a preacher, and as it was forbidden to preach without a licence, in 1660 he was thrown into Bedford gaol. If only he had promised to keep from preaching, he would have been set free. At intervals his captivity lasted till 1675; and in the end he conquered; for he was set free without making any promise, and went on preaching.

HOW BUNYAN WROTE THE STORY OF HIS OWN LIFE, CALLING IT "THE PILGRIM'S PROGRESS."

From his labours in the gaol came *The Pilgrim's Progress*. It is really the story of his own life, or that of any other Christian man. To describe his life, he took the well known allegory of a traveller on a journey. The chief character is called Christian. He sets out for a delightful land, carrying a great bundle on his back. His adventures, and the curious people he met upon the way, must be read in the book itself. It is written so simply that anybody can understand both the story itself and the allegory underneath it.

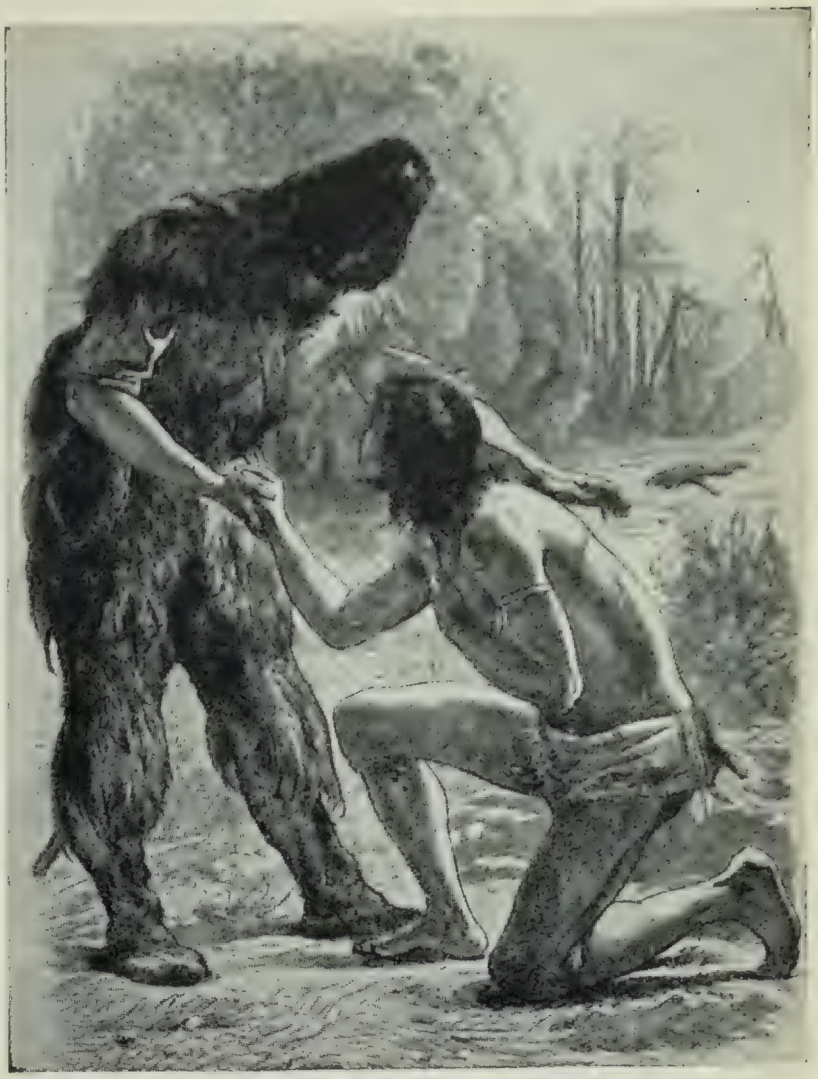
You have all heard of Robinson Crusoe and his wonderful adventures upon his island.

This is how Crusoe came to be wrecked and



Do you remember when Christian came to the Castle of Giant Despair? The fascinating tale of *The Pilgrim's Progress* will always hold countless readers enthralled.

what followed. His ship is cast upon a great sandbank and he alone is thrown ashore, carried aloft in the midst of a mountainous wave. He describes how he makes a raft and ferries himself many times to the ship, collecting stores and preparing himself for a stay upon the island. He builds himself a hut, hunts the goats upon the mountain, sows wheat and makes himself clothes ; he makes canoes, and tries in vain to escape ; and at last comes his Man Friday, who relieves the fearful loneliness that all along has been lying like lead upon him.


Robinson Crusoe, shipwrecked on what he imagined to be an uninhabited island, found a native whom he named Friday who became his faithful friend and henchman.

HOW THE FAMOUS TALE OF "ROBINSON CRUSOE" CAME TO BE WRITTEN.

After the coming of Friday other savages appear, and this leads to warfare and confusion. Finally, after being nearly thirty years upon the island, he is rescued and taken away.

The author of the book was Daniel Defoe, who was sixty years of age when it appeared in the year 1719. It is indeed a wonderful thing that a man so old should write a book so bright and young as *Robinson Crusoe.* Before this he had written a great deal, but his writings were quite different from adventure stories. He was, in fact, one of our earliest newspaper writers. His first paper, called *The Review,* came out in 1704. It is among the very earliest of our regular newspapers.

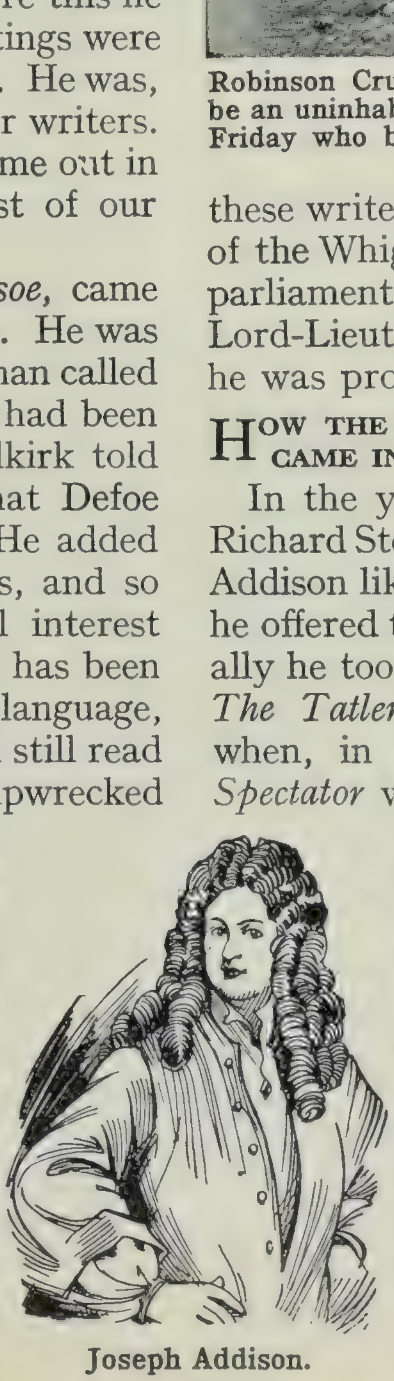
His greatest book, *Robinson Crusoe,* came to be written in rather a curious way. He was staying at Bristol when he met a seaman called Alexander Selkirk, a Scotsman, who had been marooned upon a desert island. Selkirk told his tale in such a lively fashion that Defoe determined to make a book of it. He added other details from books of voyages, and so we had his great story which will interest people for all time. *Robinson Crusoe* has been translated into nearly every living language, and boys and girls all over the world still read eagerly the experiences of the shipwrecked sailor.

NEWSPAPERS AND POLITICS: JOSEPH ADDISON WRITES FOR THE WHIGS.

You have read a little about Daniel Defoe and his first newspaper called *The Review,* which appeared in 1704.

Newspapers were then becoming very important, for in parliament two great parties were growing up. They were called the Whigs and the Tories, and each side had its own newspaper-writers.

Perhaps the most important of all these writers was Joseph Addison. A member of the Whig party, in course of time he entered parliament and was appointed secretary to the Lord-Lieutenant of Ireland. Later on, in 1717, he was promoted to be a Secretary of State.

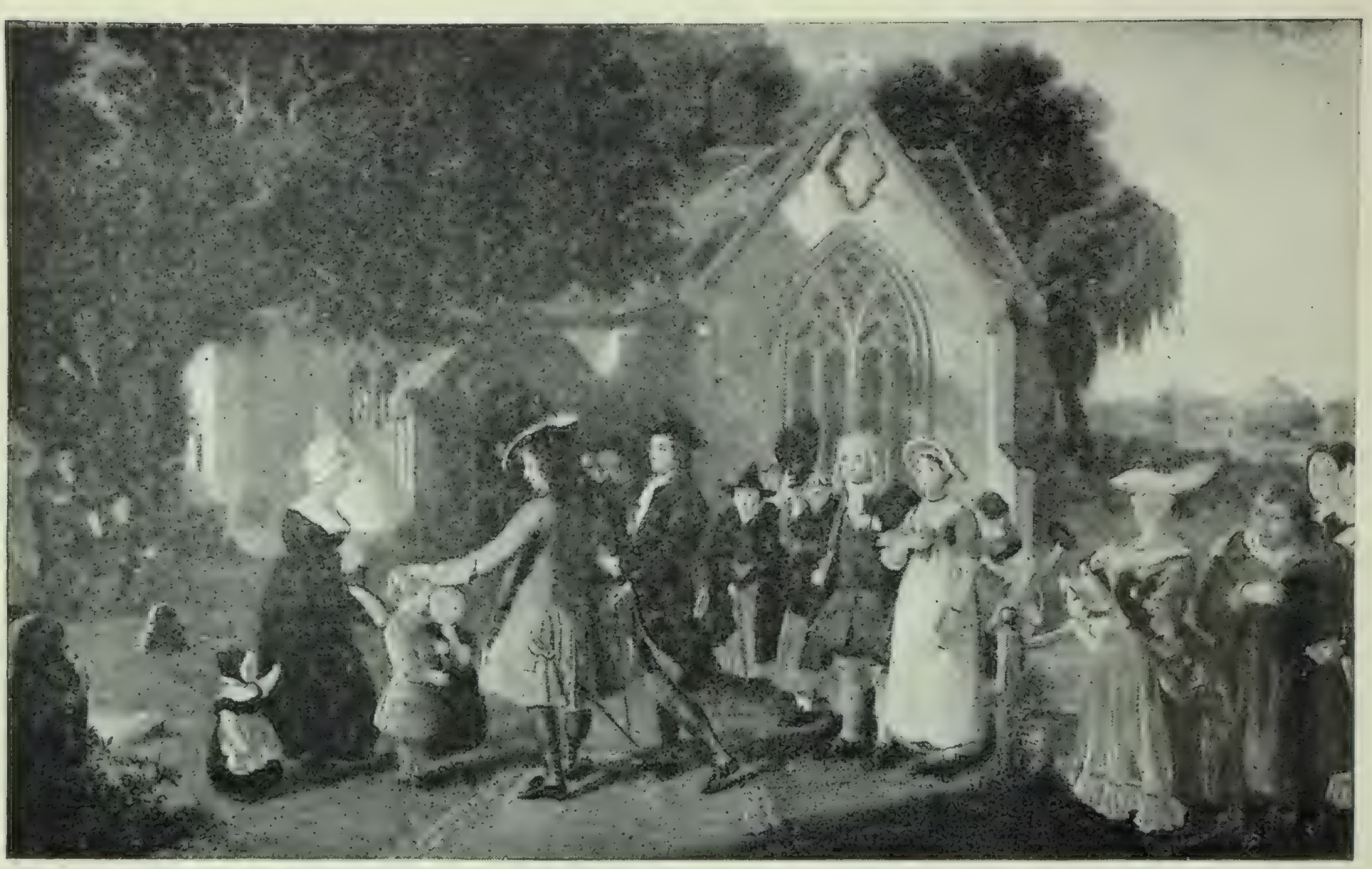

Joseph Addison.

HOW THE "TATLER" AND THE "SPECTATOR" CAME INTO BEING.

In the year 1710 an old school-fellow, Sir Richard Steele, began a paper called *The Tatler.* Addison liked the early numbers so much that he offered to help Steele to write it and gradually he took an important part in the writing. *The Tatler* was dropped in January, 1711 ; when, in March of the same year, *The Spectator* was begun it was Addison and not Steele who was the chief man behind it.

The greater part of the paper was taken up with an essay. At first the essays were written by Steele, and then Addison, taking a hand, came to write most of them.

Those were the days of social clubs, which met in coffee-houses. It was therefore to be expected that Mr. Spectator (an imaginary character introduced in the first number of the *Spectator*) should



Sir Roger de Coverley, a child of Joseph Addison's brain, was a popular country gentleman whose exploits make interesting reading. He is seen on his way to church, blessing the children, and greeting a row of respectful villagers.

have a club, and his was called the Spectator Club. The chief member of the club, and one who becomes gradually more important as the paper goes on, is Sir Roger de Coverley.

IT IS VERY INTERESTING TO FOLLOW SIR ROGER'S ADVENTURES.

Sir Roger, like Mr. Pickwick, is one of the most charming characters in English fiction, and after his introduction different essays regularly appeared, describing Sir Roger at the theatre, at church, at the assizes, in London, and so on. Finally, to the great grief of his readers, Addison made Sir Roger die at the baronet's country-seat at Worcestershire.

The stories about Sir Roger made amusing reading, and the circulation of *The Spectator* increased beyond all Addison's expectations. But, almost without knowing it, he was doing a much greater thing than merely increasing the numbers of his paper. He was setting a new fashion in English literature by creating a great character. Sir Roger de Coverley is the beginner of a long line of famous characters in fiction who stretch right down to the present day.

HOW JONATHAN SWIFT WAS DRIVEN BY CIRCUMSTANCES TO IRELAND.

Now we turn to a very unhappy though brilliant man, Jonathan Swift, Dean of St. Patrick's, Dublin, and our greatest satirist.

Born in Ireland, of English stock, he came to England in 1689 as secretary to a statesman called Sir William Temple, who was a very distant relative, but in a short time they parted in anger and Swift returned to Ireland.

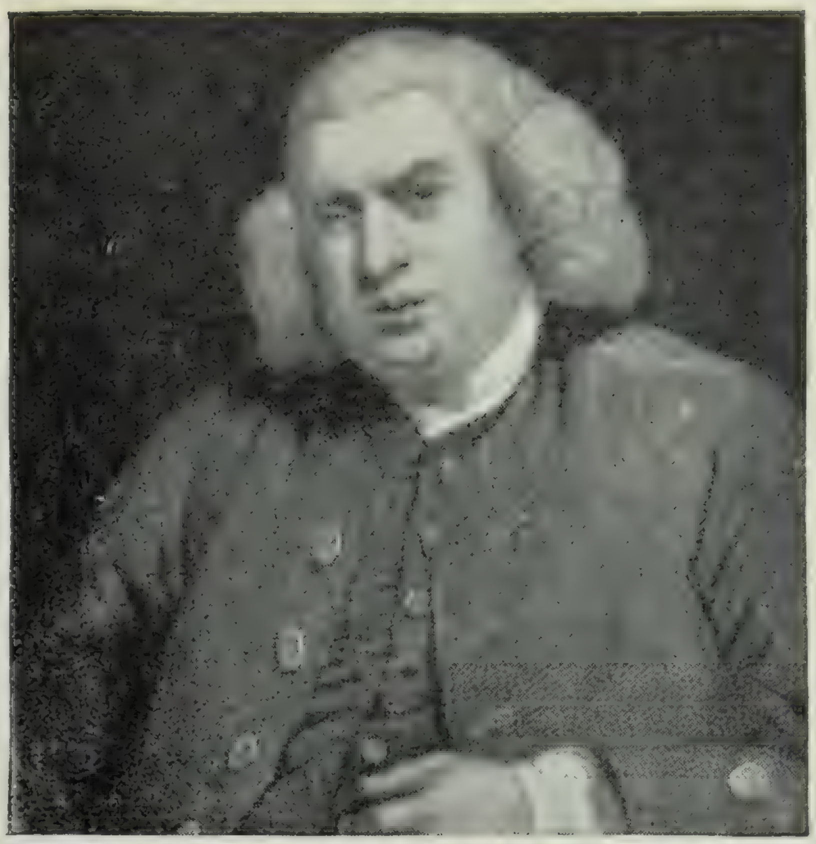
After a year or two in Ireland he was only too glad to accept an offer from Temple to return to England and be his secretary again. This post he held till Temple's death in 1699. An unkind fate, however, seemed continually to be driving Swift to Ireland. After being unsuccessful in his application for several appointments he was compelled to go to be a clergyman in County Meath.

WHEN SWIFT PREACHED TO A CONGREGATION OF ONLY FIFTEEN PERSONS.

The English Church in Ireland, though it had been established for a long time, was still no better than a stranger in a strange land. In one of Swift's churches, for instance, the congregation numbered fifteen persons.

Such idleness was not suited to a man of Swift's fiery nature. He began to write powerful books on the politics of the day; and finally he took the plunge, quitted his living in Ireland, and came over to London to take an active share in the current events.

There he became the leading writer of the day. His journal, *The Examiner*, founded in 1710 to help the Tories, was the terror of the Whigs. But the Tories fell from office, and all



Samuel Johnson, the essayist, spent a great deal of time and care compiling his famous Dictionary. The story of his life has been written by James Boswell. [*By Reynolds*

Swift's power was gone. He had hoped to be made a bishop, but he had to be satisfied with the Deanery of St. Patrick's, and back he went to Ireland, a disappointed man.

He laboured on behalf of the Irish, and became one of the most popular men in the country, but he was never happy. His health began to give way. His nature became more and more savage and silent. Such conduct was really the result of a deadly brain disease, which was finally to overcloud his reason and make him die a madman.

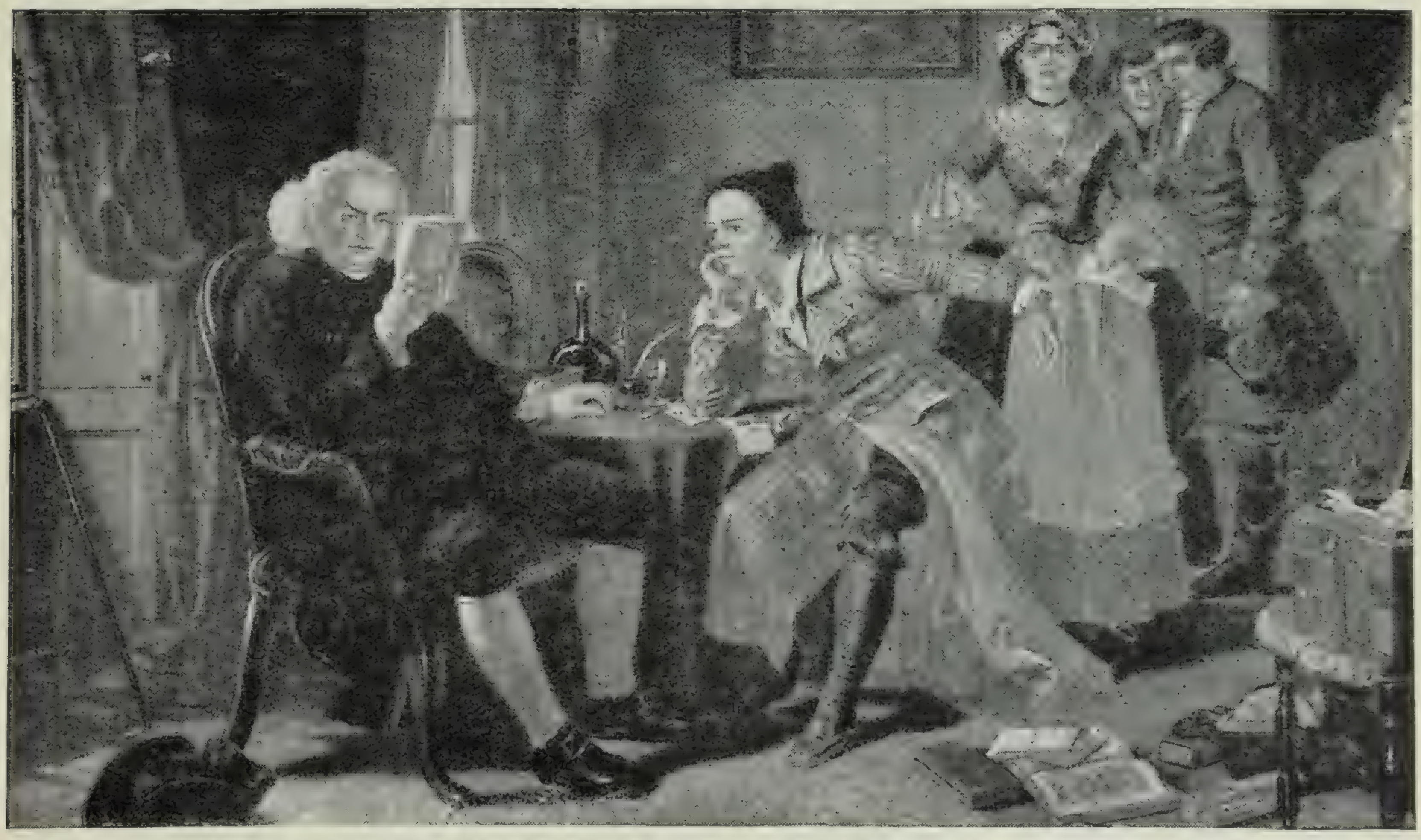
GULLIVER FINDS HIMSELF IN THE LAND OF THE LITTLE MEN.

It was while he was gradually slipping down into the depths of lunacy and despair that he produced his greatest book—*Travels Into Several Remote Regions of the World, by Lemuel Gulliver.* Everybody now knows it as *Gulliver's Travels.*

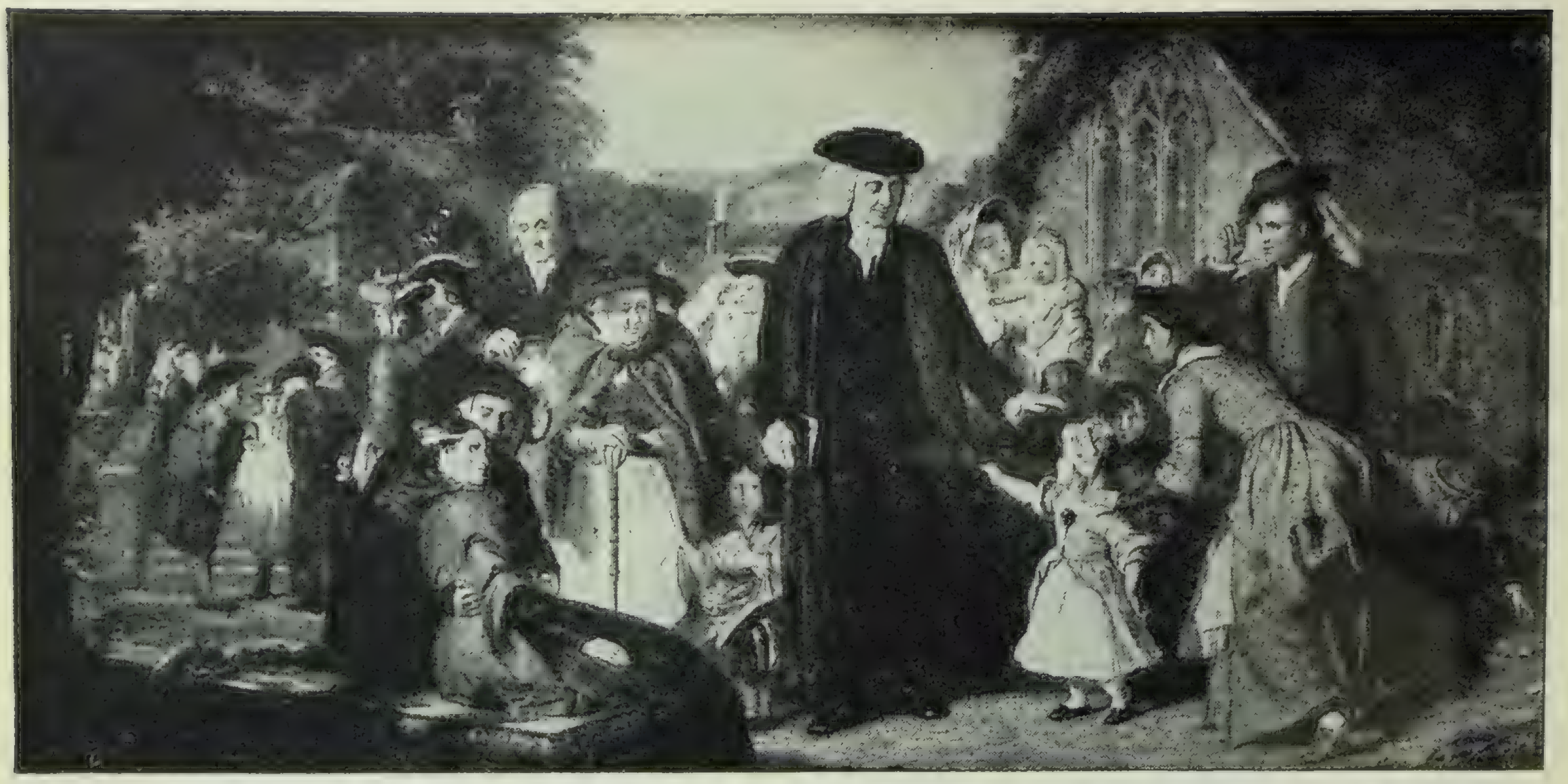
Gulliver is the doctor, and latterly the captain, of a ship. He makes four journeys—to the little men (Lilliputians), to the giants (Brobdingnagians), to the floating island of Laputa, and to the region inhabited by the horses and the horrible creatures called Yahoos. It is a satirical allegory, for it sets out to make a mockery of the vices of the time. Yet we need not be concerned with the allegory. In its way *Gulliver's Travels* contains many more impossible events than does *Robinson Crusoe*; yet such is the clearness of Swift's style that we soon begin to accept his account as something that actually happened.

HOW "THE LIFE OF SAMUEL JOHNSON" CAME TO BE WRITTEN.

Of all the great men in the history of our literature no one is better known and more admired and respected than Dr. Johnson.



Goldsmith, who was always in debt, was saved from being turned out by his angry landlady when Johnson arrived and discovered the MS. of *The Vicar of Wakefield*. We see him reading the story with absorbed interest.



Oliver Goldsmith's story of the *Vicar of Wakefield* is one of the earliest of our English novels. The painting above shows the old vicar passing from the church, and blessing his parishioners, young and old, who throng round him.

This is due almost entirely to a Scotsman, a friend of Dr. Johnson, called James Boswell. Boswell came specially to London to make the acquaintance of Johnson. This he did so thoroughly that he wrote one of the biggest and best biographies in our language, *The Life of Samuel Johnson.*

Samuel was born in 1709 at Lichfield, a small town in the midlands of England. His parents were too poor to send him to college, but a rich neighbour agreed to help them with their son's education. Samuel, therefore, was sent to Oxford, where he was enrolled at Pembroke College.

However, the rich neighbour did not give all the help that had been expected from him. Samuel's father died, and all his little money went to keep the widow. So Samuel had to give up all idea of finishing his university course.

THE MAN AND HIS BOOK: JOHNSON AND HIS DICTIONARY.

To make a living, he came to be a member of what was then known as *Grub Street.* This was actually a street in London like Fleet Street. But the name was given in mockery to the wretched conditions in which the poorest authors lived. During this time of poverty he wrote a few poems, which drew upon him the attention of some of the famous writers of the day. He also began to work upon his *Dictionary.*

It took Johnson more than five years to bring out the dictionary. He did not do all the work himself, being assisted by writers who were poorer than himself. As the work upon the dictionary came near an end, it began to be widely known that it was to be a really wonderful book, one that would make every previous dictionary out of date.

A GATHERING OF FAMOUS MEN UNDER JOHNSON'S LEADERSHIP.

Johnson's reputation as a writer grew and spread. In the course of time he became the leader of London literary men. He founded a famous club, of which some of the great men of the time became members. Oliver Goldsmith, a famous writer, was a member, and so was James Boswell, who, as we said, wrote Johnson's "Life." Among other well-known members were David Garrick, the greatest actor of the day, whom Johnson had taught as a boy; Sir Joshua Reynolds, the great portrait painter; and Edmund Burke, the splendid orator. All these men united in doing homage to Johnson as the greatest man of them all.

In the end Johnson, after his long struggles, received his reward in money. The Government offered him a pension of three hundred pounds a year, which he accepted. The last years of his life were spent in the happy idleness that suited him best, and when he died in the year 1784, at the age of seventy-six, he was buried in Westminster Abbey, for he was a man who stood for what is best and wisest in our literature.

"NOLL" GOLDSMITH, TRAVELLER, POET AND NOVELIST.

In all our long gallery of authors, there is surely no more likeable man than the careless, lovable spendthrift, Oliver Goldsmith.

His father was a clergyman in the county of West Meath. The family lived in a big house near the village of Lissoy, which may be the place which the poet described later as the "Deserted Village."

When Oliver left his old village schoolmaster and went to other schools, he had an unhappy time. He had an ugly face, pitted with smallpox, and the other boys jeered at him. He could not learn his lessons, and the teachers flogged him.

HOW MISFORTUNE DOGGED GOLDSMITH'S FOOTSTEPS ALL HIS LIFE.

When he left school and tried to take up a career, his troubles only increased. He went to Trinity College, Dublin, as a *sizar*, or poor scholar. He neglected his studies, failed in his examinations, and was punished for playing all sorts of pranks. Over and over again his relatives gave him money to start him upon some useful career. But he always squandered the money, and returned home cheerfully to ask for more.

At last his friends grew so tired of his reckless habits that they simply packed him off to look after himself. He did so in his own curious fashion. Equipping himself with a flute, he tramped through Holland, France, and Switzerland, keeping himself by playing on his instrument.

In 1756, at the age of twenty-eight, he returned to England with no prospects, no friends, and no money. He became an usher in a school, and hated it. Then he took to doing odd jobs for booksellers. He did not like this kind of work very much either; but he persevered, and in the end he won success.

MANY POEMS AND STORIES FLOWED FROM GOLDSMITH'S PEN.

In those days there was in London a company of famous writers, of whom the chief was Dr. Samuel Johnson. They had formed themselves into a very select club, just like the Spectator Club, calling it *The Literary Club*, or, more simply, *The* Club. It shows how great a favourite Goldsmith had become when we find that he was one of the chief members of the club.

Goldsmith would never have been admitted as a member of the club if he had only done hack-work for publishers. He had done worthier things than that. A poem called *The Traveller*, which describes his journeys through Europe, brought him much fame and a little money; his *Deserted Village*, which we have already mentioned, increased both his fame and his money. The best book he wrote was the story called *The Vicar of Wakefield.*

All boys and girls used to read *The Vicar of Wakefield*. It is to be hoped that they will continue to do so. There is so much quiet fun in the story, and so many pathetic scenes as well, that no one who wants to read the best in our literature should miss it.

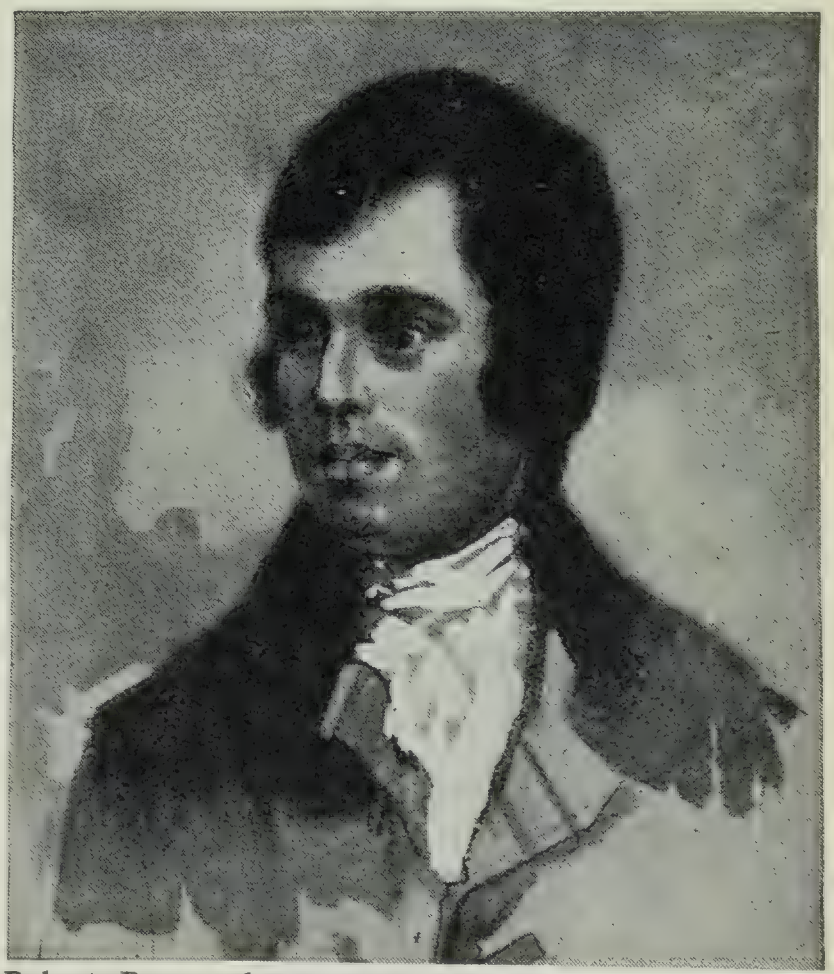
Goldsmith also wrote a play, called *She Stoops to Conquer*, which was one of the most popular comedies of the period. He died in 1774, at the age of forty-six.

THE SCOTTISH POET WHOSE SONGS ARE SUNG ALL OVER THE WORLD.

There is no name that Scotsmen hold in greater honour than that of Burns.

Burns was a man of the people, born among humble folks. He knew toil, and sorrow, and the despair that comes from neglect and ingratitude. His songs echo these feelings with such power and sweetness that every thinking person, not Scotsmen alone, says to himself, "Here is a true poet of mankind."

His father was a small farmer, toiling without ceasing in order to gain a living out of the poorest land in Ayrshire, and could not afford schooling for his sons. To the hardships of his early years we can trace some of Robert Burns's later weaknesses—his bad headaches, his fits of gloom, and, perhaps, his desire for excitement to drive away his bitter thoughts.



Robert Burns—the greatest of Scotland's bards. His beautiful songs and poems are treasured by all who realise their simplicity and human appeal.

Even amidst such unhappy surroundings the fire of true genius cannot be put out. The young poet managed to put in a little schooling. In his spare time he read everything that came his way. Even more useful than his reading was his power of noticing things round about him. Burns loved the humblest of nature's creatures. But he was as keenly interested in his fellow-men. He knew the Scottish folk, and loved them, too. They were his own people, and his songs came right from his heart.

Burns's father died, of sheer hard work, when the poet was twenty-five years old. The two brothers, Robert and Gilbert, toiled for four years upon a farm of their own at Mossgiel. In return they received no more than a common labourer would be paid on another man's farm.

HOW BURNS WAS RECEIVED AND FLATTERED BY THE LORDS AND LADIES OF THE LAND.

At length Burns resolved to emigrate. He had actually booked his passage, when a friend wrote to him telling him that the little Kilmarnock volume of his poems had made quite a stir in Edinburgh. This welcome piece of news made Burns pause. He cancelled his passage to the West Indies and came to Edinburgh in the same year, 1786.

In the Scottish capital he was received as a great man. The houses of the nobility were thrown open to him. He had only to appear, to be surrounded by crowds of flatterers. Yet he behaved with the greatest good sense.

HAVE YOU READ THE JOLLY TALE OF "TAM O' SHANTER" AND THE WITCHES?

Poetry, he found, could not bring him enough money to live on, so he turned to farming again. But now his health was failing. A great weakness affected him, and his fits of gloom became more marked. Yet at this time he wrote the poem, full of rollicking fun, called *Tam o' Shanter*.

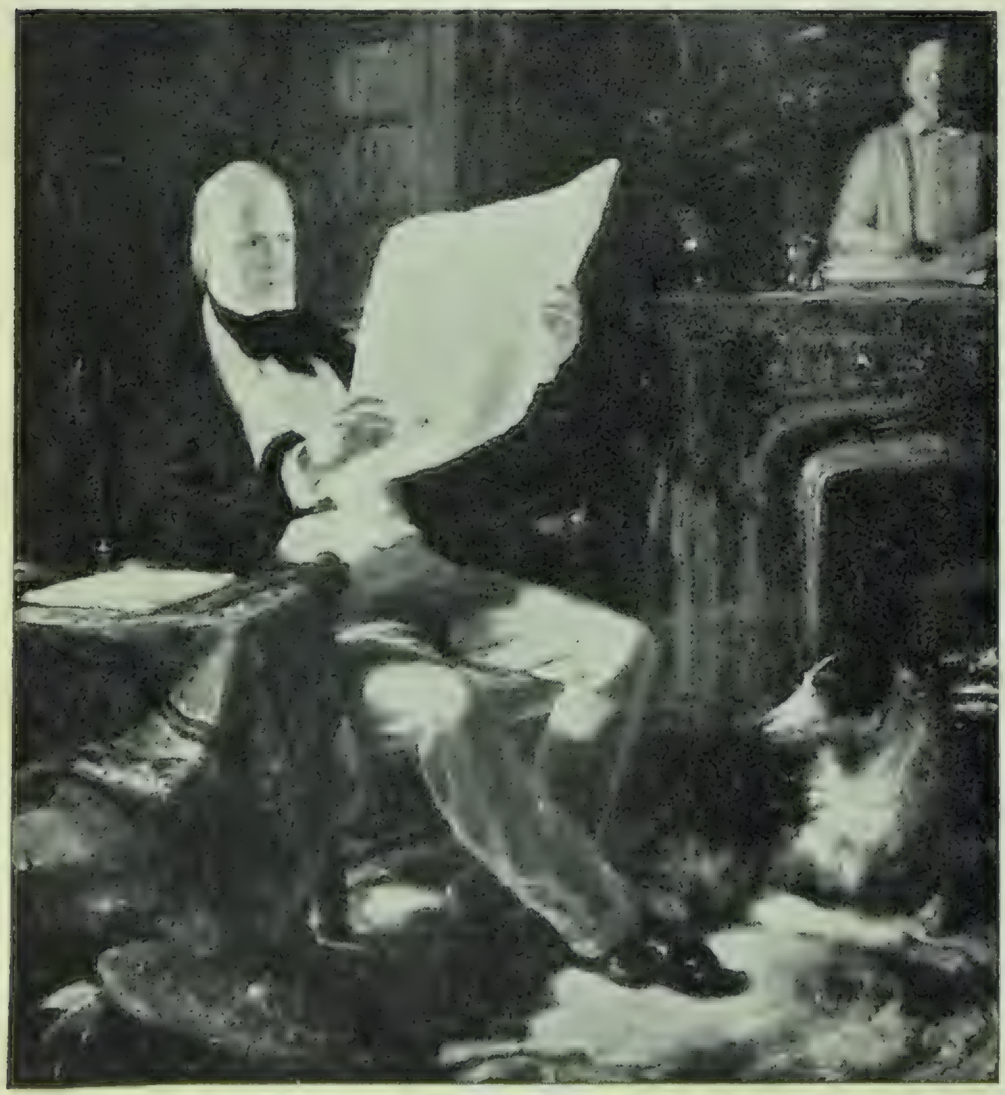
Tam o' Shanter is one of the best stories we have in British poetry. There is no jollier or more exciting tale than that of Tam, whom Burns calls "a bletherin', blusterin', drucken blellum," and the witches in the haunted Kirk of Alloway.

Yet, in spite of the success of such poems, Burns's worries were still serious. To ease him in his troubles, a friend helped him to get an appointment as an exciseman. His duties took him continually among strong drink, for which, unhappily, Burns had always had a craving. So the post of exciseman, though it was given to him as an act of kindness, was by no means a blessing to the poet. In the course of his duties he removed to Dumfries, where he died, and where you may see his tomb.

THE SCOTT MONUMENT TOWERS OVER THE HISTORIC CITY OF EDINBURGH.

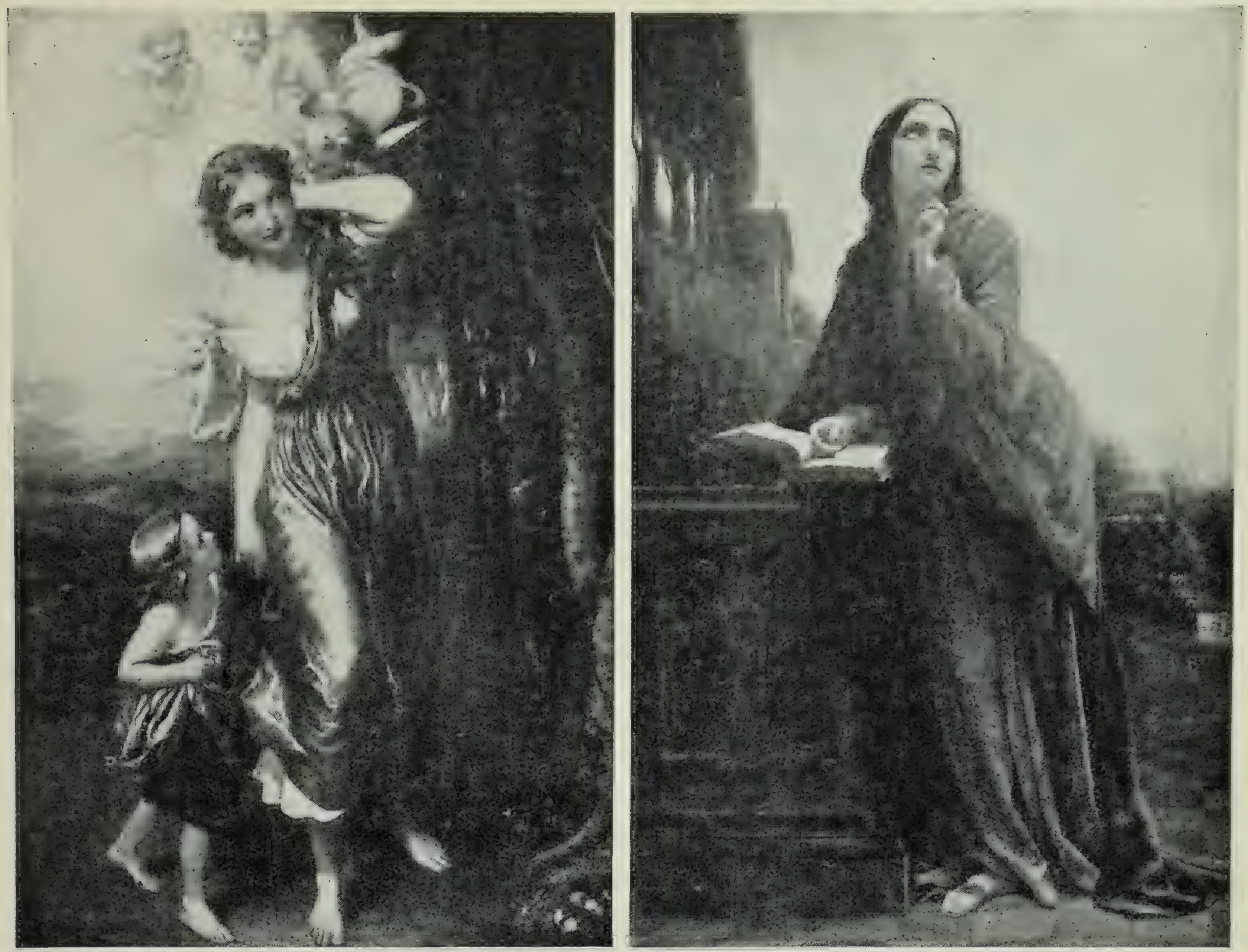
Rising high against the beautiful line of Princes Street, Edinburgh, is a great monument, like a pointed spire. This is the Scott Monument. In the midst of it sits the white marble figure of Scott himself.

Edinburgh does well to honour Sir Walter Scott. He is the most famous of her sons, born in the city, though his birthplace has long been swept away. His ancestors were old Border rievers, and Scott was very proud of them. It was his great ambition to restore the early glories of his house, and we shall see how he managed this gigantic task.

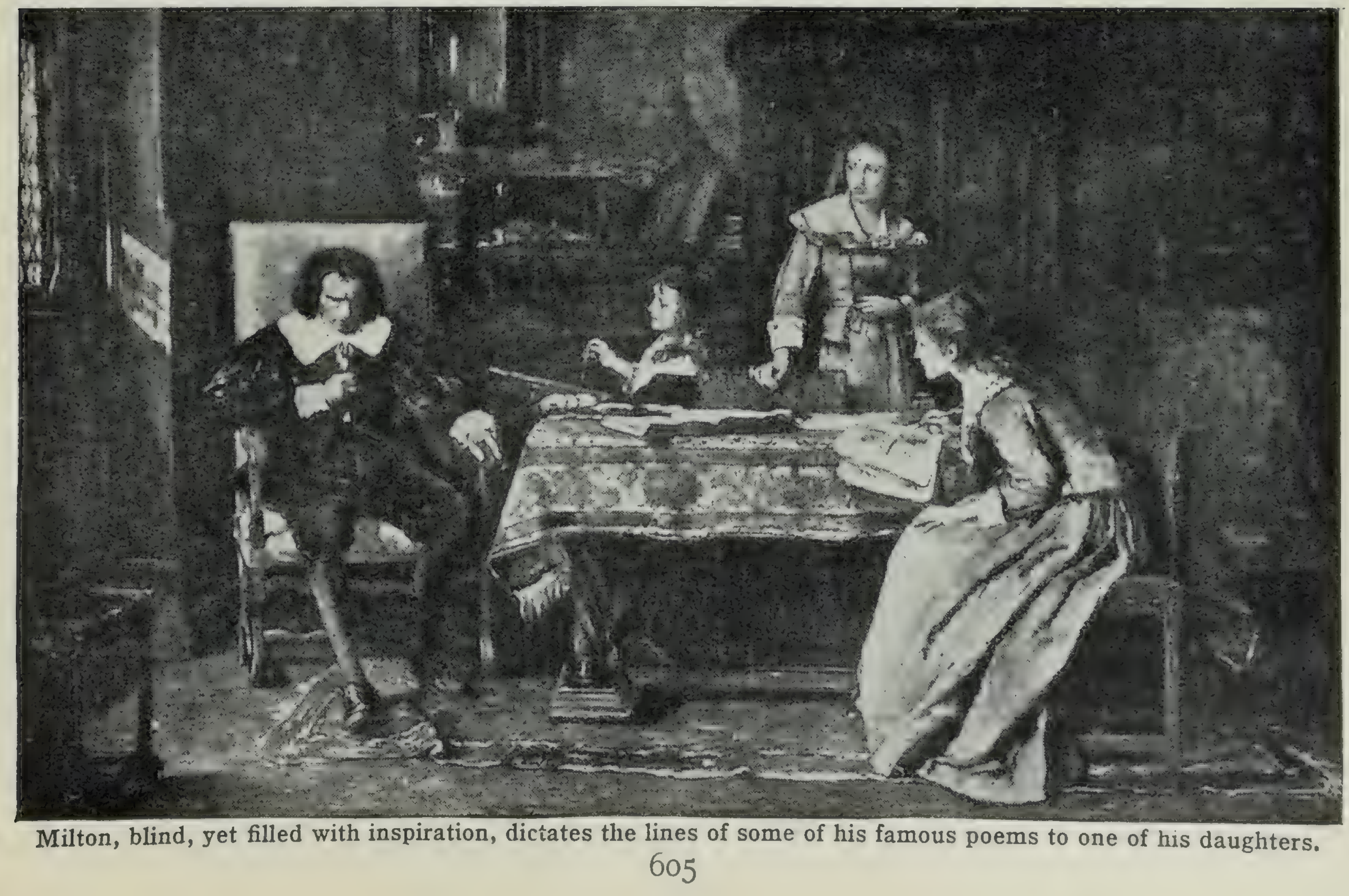


Sir Walter Scott, the author of *Waverley Novels* and many stirring Scottish tales, seated in his study at Abbotsford, with his favourite dog by his side.

MILTON, POET OF "CHEERFUL GODLINESS"

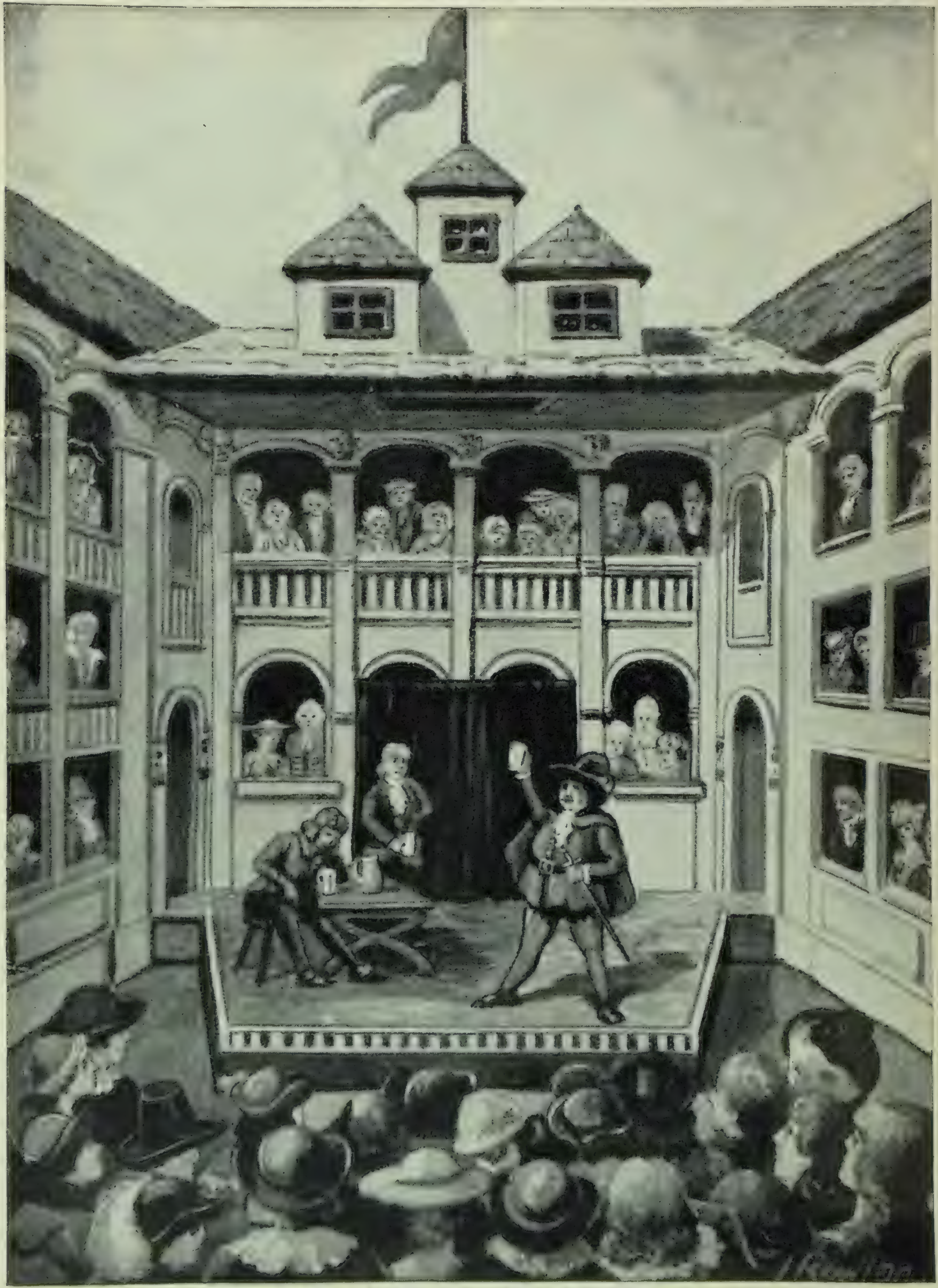


Two of John Milton's famous poems are entitled *L'Allegro* and *Il Penseroso*. The above pictures show an artist's conception of the two themes. On the left is the cheery person, L'Allegro, and on the right the thoughtful figure, Il Penseroso.



Milton, blind, yet filled with inspiration, dictates the lines of some of his famous poems to one of his daughters.

THE STAGE WHERE SHAKESPEARE HELD SWAY



In olden days the Globe Theatre was one of the most popular places of amusement in London. It was here that Shakespeare performed many of his famous plays to an admiring audience. The theatre, which was partly open to the sky, held 1200 spectators. Note the curious stage where the actors are performing.

Overlooking Princes Street, the busy thoroughfare of Scotland's capital, the Scott Monument stands, doing homage to the man who enriched Scottish literature. Thus, Sir Walter Scott's memory remains always fresh.

His father, an Edinburgh lawyer, wished his son to carry on his profession. Walter was dutiful enough to train himself as an advocate —the Scottish name for a barrister ; but his chief interest lay in the stories and legends of his native land. Yet he was not a bookish man. Although on account of a childish ailment he was slightly lame, he was big and strong and loved the open air.

He was lucky to obtain a good legal post in the Border country, the place in which his forefathers had dwelt, and which he loved best. But it was not his legal position that made Scott able to build the great house of Abbotsford : it was his enormous success as an author. His career as a writer is the most brilliant ever known. Yet he died broken down under a burden of debt. The double tale of his great success and his terrible failure is a pathetic one, and yet one which thrills us more than any other story about Sir Walter Scott.

BOOK AFTER BOOK POURED FROM THE PEN OF THIS GENIUS.

His literary successes really began with a long poem called *The Lay of the Last Minstrel.* Then he wrote other poems, and they pleased his host of readers even more than *The Lay* had done. His fine verse-story of *Marmion* is about Flodden. His *Lady of the Lake* made the fortune of the Trossachs, a romantic district of Perthshire.

But he was not content. He wished to succeed in prose as well as poetry. One day he found an old manuscript that he had put away ten years before. This was the beginning of the novel, *Waverley.* It was not a good beginning, for it was very dull. But he took it up, dashed off the remainder of the story, and so began the dazzling series of novels, known as the *Waverley Novels.*

Scott wrote nearly thirty novels between the years 1814 and 1829, as well as other books and essays on history, literature, and current events. Books poured from his pen ; and his success was boundless.

SCOTT STRUGGLED AGAINST ILL-HEALTH IN AN ENDEAVOUR TO CLEAR HIS DEBT.

Then came the crash. It would take too long here to explain the mysteries of Scott's business dealings with printers and publishers. It is enough to say that in 1826 a firm, of which he was a partner, failed and he was faced with a debt of £130,000.

He might have paid his creditors what he had, and been satisfied with that. But he refused. "I will pay twenty shillings for every pound of debt," he said, and set about working for the money.

But even his tremendous strength could not stand the strain. He had a slight shock of paralysis, and then another. A sea-voyage did him only a little good, and he returned to his beloved Abbotsford to die.

Though Scott's books are usually written for grown-up readers, he wrote one or two that are suitable for boys and girls. Of these his best-known is called *The Tales of a Grandfather,* originally written for his grandson, John Hugh Lockhart. *Ivanhoe* and *Rob Roy* are two most exciting stories from his pen and are perhaps the best for young people who wish to read Scott's novels.

THE POET WHO LIVED IN ONE OF ENGLAND'S BEAUTY-SPOTS.

One of the most beautiful and most popular of all the districts of England is called the Lake district. It takes up only an angle of north-western England, yet within that little space you will find the most wonderful variety of lake and mountain, river and moorland. It seems as if Nature had meant this region to be the beauty-spot of England.

In addition to the charms of nature, the Lake district has other attractions. It is the land of poets. In no other part of the modern world will you find within such a small space so many places sacred to the memory of great writers. The beauty of the region, no doubt, attracted men who wanted a place which would inspire them in their writings; but, more than that, they were drawn there by the fame of the poet who was the first and greatest of them all. His name was William Wordsworth.

Nearly all his life Wordsworth lived in the Lake district. He spent his days writing poetry about the people, the scenery, and the history of the place.

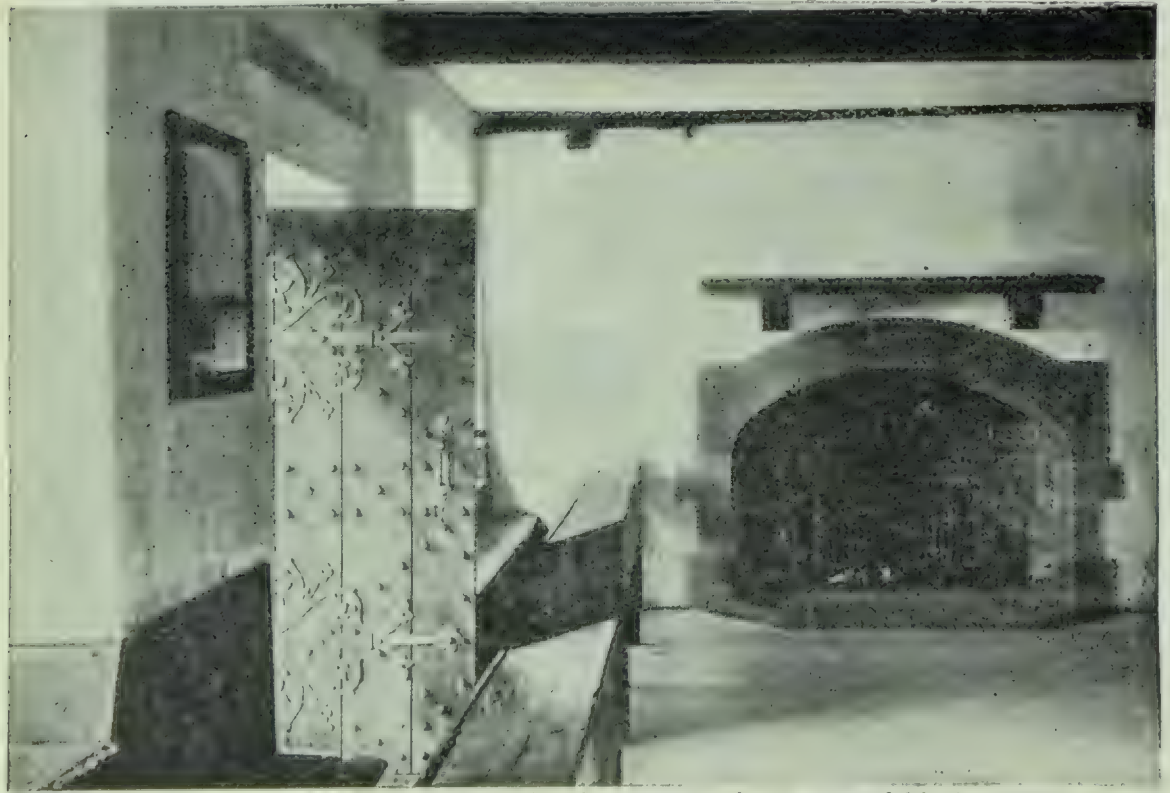
This beauty-spot, clustered round with fragrant blossoms, is Rydal Mount, Wordsworth's lake-land house. Can you wonder that poetry flowed from his pen in such surroundings? It was here that some of his best works were written. [*H. Bell*

THE FAMOUS BROTHER AND SISTER WHO LIVED IN A HUMBLE COTTAGE.

He was born in 1770, not exactly in the district, but at a little country town called Cockermouth, about a dozen miles away. When he was no more than fourteen years of age he had made up his mind to be a poet, and a poet of the wonders of nature. In this ambition he was assisted by his sister Dorothy, whose love for her brother is one of the most beautiful things in the history of our literature.

Most of their life was spent in a little cottage, called Dove Cottage, near Rydal Water. Here they lived like humble folks. Wordsworth was always abroad on the hills, noting everything that passed, and rejoicing in the wonders of nature.

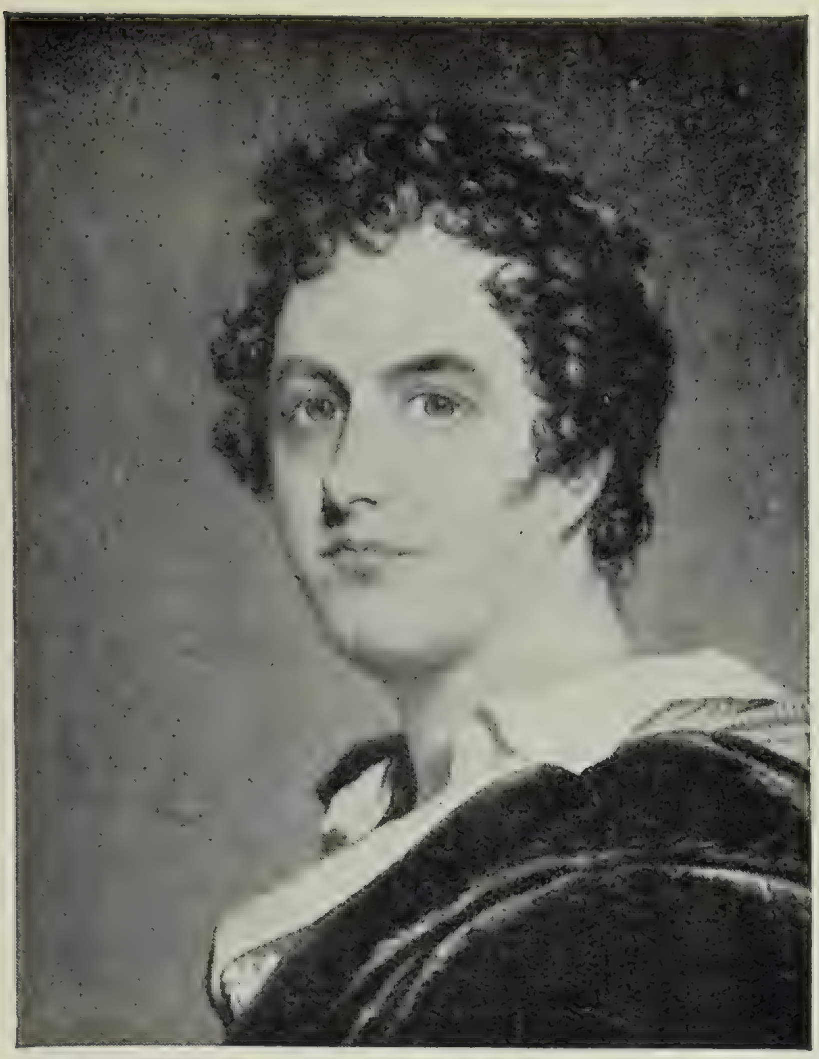
His poetry did not please the people of Wordsworth's day. They said that poets ought to "write big," that is, about great subjects, and do it in a great style. Wordsworth, on the other hand, always insisted that poets should write of simple things in a simple manner. For many years he patiently endured the hard things said about his poetry; and before he died in 1850 he had the satisfaction of being Poet Laureate and of knowing that he had already won a lasting place among the famous poets.



Wordsworth sat at this quaint old desk when composing some of his beautiful poems about the lovely scenery of the Lake district in England where he lived. [*H. Bell*

COLERIDGE—ANOTHER FAMOUS POET OF THE LAKE-LAND DISTRICT.

Another of the well-known poets who lived in the Lake district was Samuel Taylor Coleridge. With Wordsworth he planned a book of poems called *Lyrical Ballads*, which was published in Bristol in the year 1798.



Lord Byron, a handsome and clever youth, had a very adventurous and romantic career. He died in Greece fighting in the Greek struggle for independence. [*Rischgitz*

For this book Coleridge wrote two poems, one of which is without doubt the most amazing story ever told in English verse. It is called *The Rime of the Ancient Mariner.* It tells how a sailor with " a long gray beard and glittering eye " seizes upon one of three wedding-guests, and forces him, by the mere power of his glittering eye, to listen to a long story of the southern seas.

Wordsworth and Coleridge are the two most famous Lake poets. Other famous men of the Lake district are Robert Southey, whose *Life of Nelson* is still read ; Thomas De Quincey, who took opium and wrote a book about it ; and Thomas Arnold, who was a famous headmaster of Rugby School.

THREE CLEVER POETS WHO HAD SHORT, BUT BRILLIANT, CAREERS.

There is an old Greek saying that those whom the gods love die young. It was never better shown than in the case of the three poets, all blessed with wonderful gifts, called Byron, Shelley, and Keats.

First let us take Lord Byron, the eldest of the three, for he was born first (in 1788) and died last (in 1824). Of the three, moreover, his is the most remarkable history.

Byron seemed to have all the good gifts, and yet there was always something to make them go wrong. Chiefly, he had the gift of writing wonderful poetry, though he often abused it by wilfully writing verses unworthy of himself. For he was a wilful, moody, and passionate man.

For a few years, from 1812 to 1816, he was the darling of London society, where, on account of his cleverness, his handsome appearance, and his poetry, he was welcomed as the guest of the finest people. He married a rich heiress, but his wild ways made him intolerable both to her and to other people, and in 1816 he left England, never to return.

THE YOUNG POET WHO CROWDED MANY ADVENTURES INTO HIS SHORT LIFE.

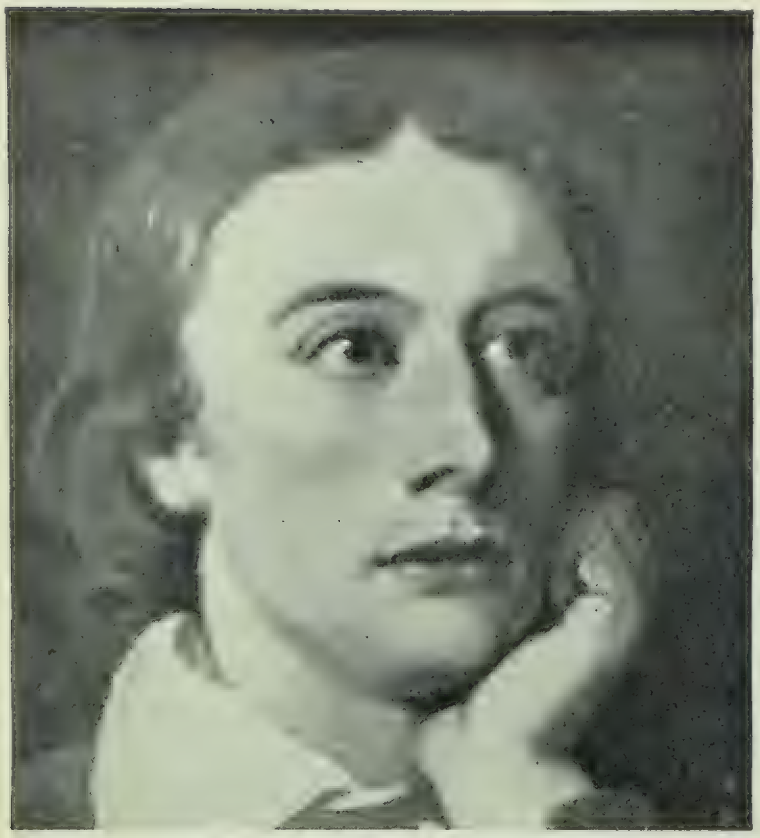
A homeless adventurer, he wandered over the Continent, writing poetry to describe his wanderings. He called himself *Childe Harold,* and his poem about his travels is called *Childe Harold's Pilgrimage.* For quite a long time he lived in Venice.

Then came the end. The Greeks were fighting for their liberty against the Turks, and Byron thought he should help them to gain their freedom. He hastened to Greece, but caught fever and died in a wretched little Greek village called Missolonghi.

Byron was a wonderful poet. You should read his poem on *The Isles of Greece,* and some songs he wrote when he was quite young and lived in Scotland. One of these, *Dark Lochnagar,* has been set to music.

Of a nature very different from that of

Shelley, another young poet, was a great friend of Byron. Two of his beautiful poems, *The Cloud* and *The Skylark,* are gems treasured by all lovers of poetry. [*Rischgitz*



Keats, the young poet who loved Nature and wrote many verses in praise of it. He wrote beautiful poetry but had many critics who made his short life unhappy.

Byron was his friend and fellow-poet, Percy Bysshe Shelley, who was born four years after Byron, in 1792. Byron was scornful and proud; Shelley was bright and eager, full of brilliant ideas and burning to carry them out.

He had many noble ideas and desired no more than the welfare of his fellow-men. But he came strongly up against the world as it was. His schoolfellows at Eton called him "Mad Shelley," and he was expelled from Oxford for putting his wild opinions into a book.

SHELLEY'S CAREER COMES TO A TRAGIC END DURING A YACHTING CRUISE.

All the while Shelley was rejoicing, as a poet can do, in Nature and her moods. His beautiful poems to *The Cloud* and *The Skylark* show this, as do many other short poems. His *Ode to the West Wind* is one of his very best. This poem was written in Italy, where he went shortly after his first wife's death.

Shelley, like Byron, had a yacht, in which he went cruises along the coast. One day, the 8th of July, 1822, he set sail to go to Leghorn to meet a friend. On the way a terrific squall sprang up and the yacht went down. A week afterward Shelley's body was cast up on the beach, and there it was burned, in the manner of the people of old. His ashes were buried in the Protestant cemetery in Rome.

THE YOUNG POET WHO LOVED TO WRITE ROMANTIC TALES OF THE PAST.

Keats also was an outcast from England, but not for his conduct or opinions, like Byron or Shelley. He was driven out by bad health.

Like Byron and Shelley, whom he knew slightly, he was a born poet. But, unlike them, he lived in the past. He liked to write about dreamy romantic subjects, especially love-stories. He loved Nature too, but still in a sad and thoughtful fashion, as you may read in his beautiful poems *To Autumn* and *To the Nightingale.*

This sad and sentimental note in his poetry made hard-hearted people, who perhaps did not know the real reason for it, laugh at him. It is said that a very unkind and unfair article written in a magazine about his poetry hurried on his death.

Here is a splendid verse from Shelley's *Adonais* describing Keats:

"A pardlike Spirit beautiful and swift—
A love in desolation masked; a Power
Girt round with weakness; it can scarce uplift
The weight of the superincumbent hour;
It is a dying lamp, a falling shower,
A breaking billow; even whilst we speak
Is it not broken? On the withering flower
The killing sun smiles brightly, on a cheek
The life can burn in blood, even while the
heart may break."

THE POOR BOY WHOSE FATHER WAS PUT IN A DEBTOR'S PRISON.

The poet Wordsworth wrote about his fellow-poet, Robert Burns:

Deep in the general heart of men
His power survives.

Now, that can be said just as well about the great story-writer called Charles Dickens. He is the author whose name is dearest to the hearts of Englishmen, just as that of Burns appeals most to Scotsmen.

Dickens came of a rather poor family, just as the Ayrshire poet did. He was born near Portsmouth, in a little house which is now a museum, open to all who admire his books. In 1814, while Charles was only two years old, the family removed to Chatham, on the Thames, below London. In the opening chapters of one of his best books, *Great Expectations*, you will find a splendid description of the marshes of the lower Thames.

When he was about ten years old, he had an experience that was to leave a deep mark upon all his after life. The family removed to London, and there the father's idle, extravagant habits led him so deeply into debt that he was put into the debtors' prison of the Marshalsea.

Charles, at the age of ten, was set to work to help the family fortunes. He entered a blacking warehouse and for the salary of six shillings a week he stuck labels on blacking-bottles.

DICKENS'S DREAMS COME TRUE WHEN HIS FIRST BOOK IS PUBLISHED.

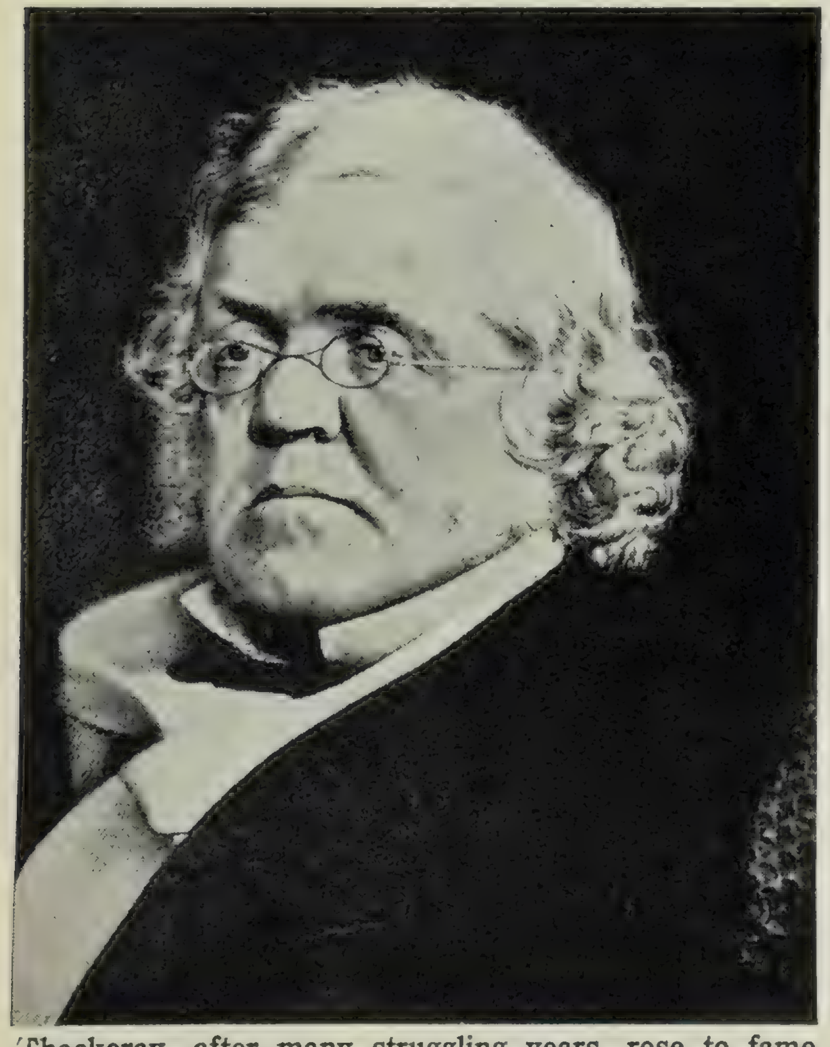
Fortunately this period of great poverty did not last long. Charles went back to school, and afterwards entered a lawyer's office. But he always had dreams of being an author, and set to work to make his dreams come true. He studied and mastered shorthand and then obtained a post as reporter on a newspaper. Then he began to write.

His first real book, and the one that many people think is his greatest book, is *Pickwick Papers*. It is a tremendously long story, and the best incidents are very funny. He tells you about the dear old gentleman Mr. Pickwick, and his comic servant, Sam Weller. A club, called the Pickwick Club, has several members nearly as funny as Mr. Pickwick himself.

The Pickwick Papers set all England laughing. Dickens leaped into fame as the most popular writer of the day, a position he retained all his life.

After *Pickwick Papers* one of the most popular of his stories was *David Copperfield*. This should be read, because much of it is the story of his own life. He liked it best of all. " Like many fond parents," he said, " I have my favourite child, and his name is David Copperfield."

Charles Dickens is a name that will live for many generations. His books—full of human appeal—have touched the hearts of thousands of readers of all ages and classes.


Thackeray, after many struggling years, rose to fame when *Vanity Fair* captured the attention of an admiring throng of readers. He was also a good artist. [*Rischgitz*

WHICH OF DICKENS'S STORIES DO YOU LIKE BEST TO READ?

Most boys and girls prefer *Oliver Twist* as a story. It is about the workhouse boy who " asked for more." And if you want a good strong story of the French Revolution, you should read *A Tale of Two Cities*.

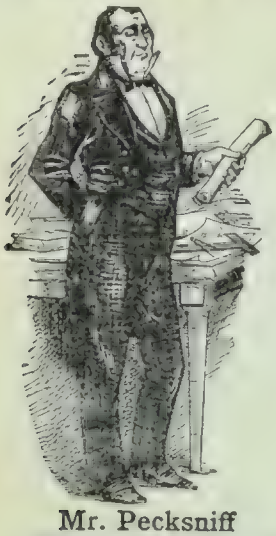
Perhaps the most popular of all Dickens's books, especially with the youthful, is *A Christmas Carol*, a story about the old miser Scrooge and the Cratchit family. You will find abundance of fun and sadness in this book, which is quite short.

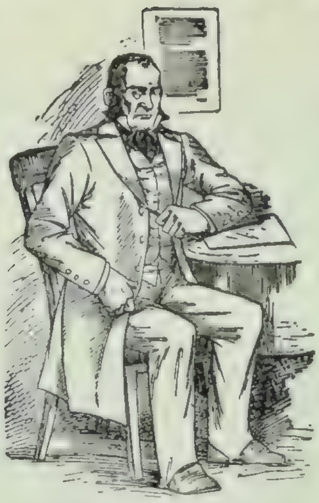
In 1870 Dickens died very suddenly at his splendid house at Gad's Hill, near Rochester, and was buried in the Poets' Corner of Westminster Abbey.

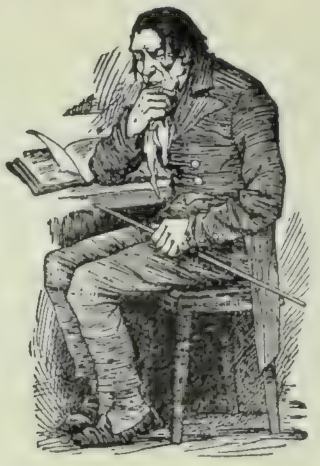
THE MAN WHO HAD A STRUGGLE BEFORE HE COULD FIND FAME.

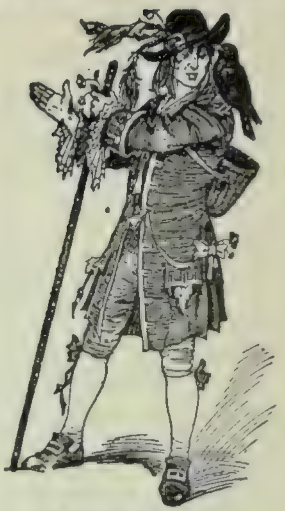
Thackeray was born in 1811, only a year before Dickens. Yet, though both men lived and worked at the same time, their careers were not alike. Dickens became famous all at once when he published his first long book, *Pickwick Papers*. Thackeray had no such good fortune. Dickens succeeded in making people laugh and cry ; Thackeray, on

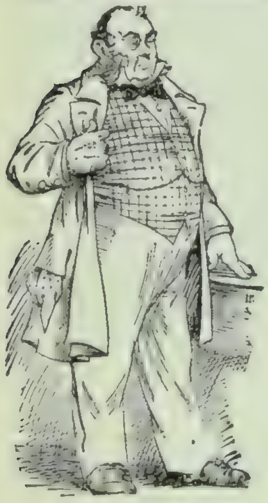
OLD FRIENDS, ACQUAINTANCES AND FOES

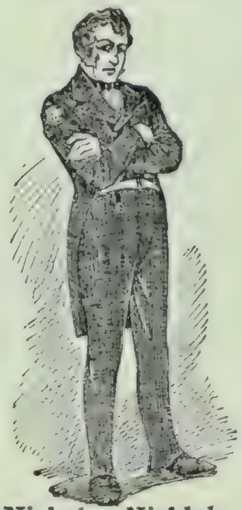

Mr. Pecksniff
(*Martin Chuzzlewit*)


Mr. Gradgrind
(*Hard Times*)


Mr. Squeers
(*Nicholas Nickleby*)


Barnaby Rudge
(*Barnaby Rudge*)


Mr. Sapsea
(*Edwin Drood*)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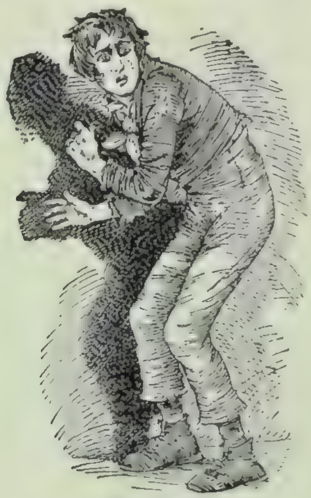
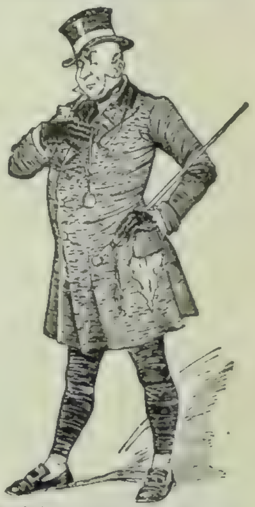
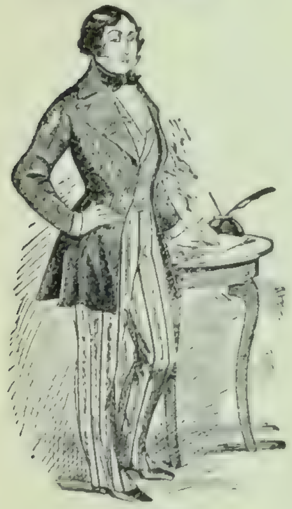
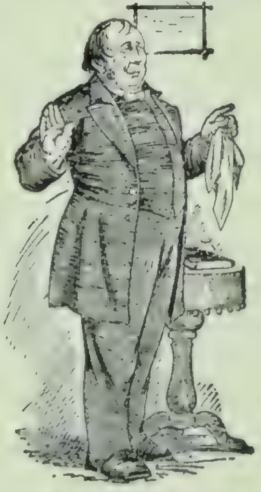
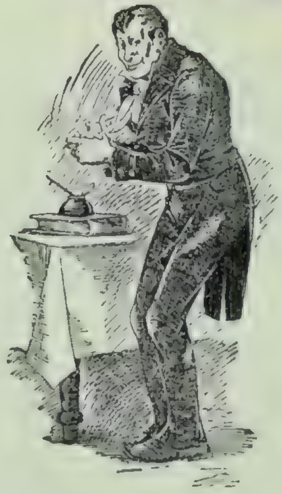
(*Nicholas Nickleby*)

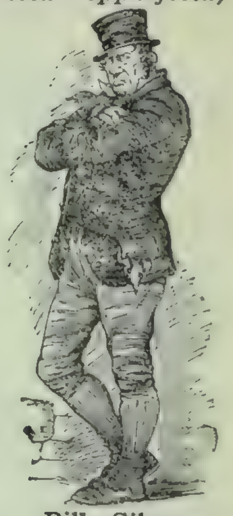

Smike
(*Nicholas Nickleby*)

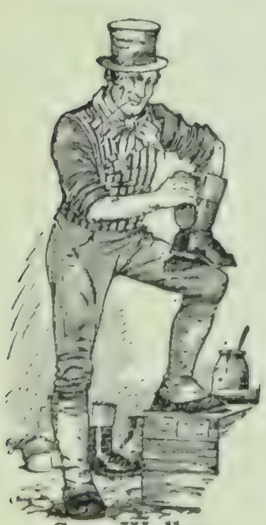

Wilkins Micawber
(*David Copperfield*)

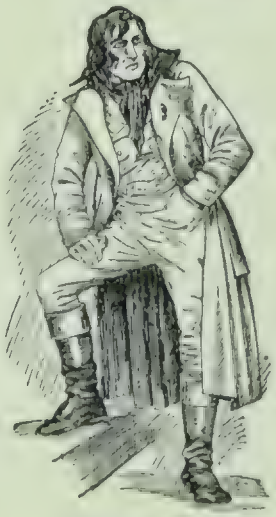

Toots
(*Dombey and Son*)

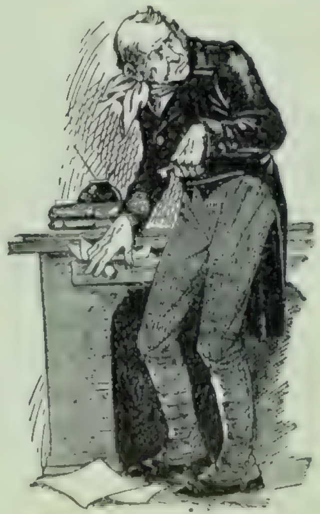

Mr. Chadband
(*Bleak House*)

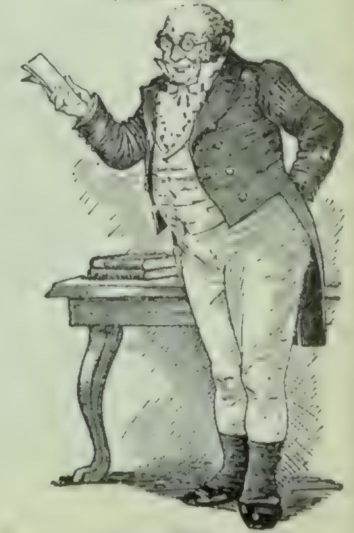

Uriah Heep
(*David Copperfield*)


Bill Sikes
(*Oliver Twist*)

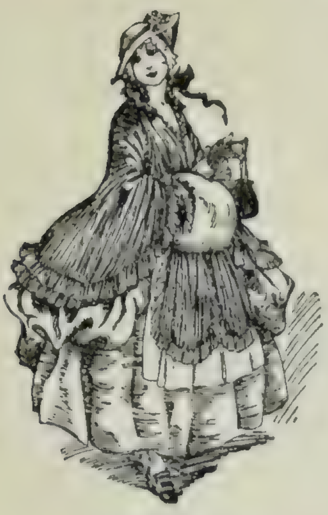

Sam Weller
(*Pickwick Papers*)

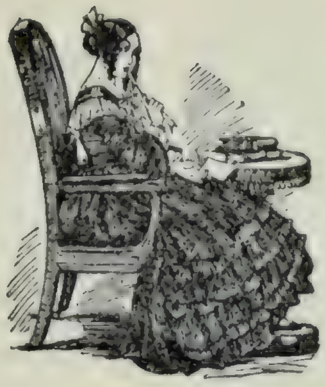

Sydney Carton
(*Tale of Two Cities*)

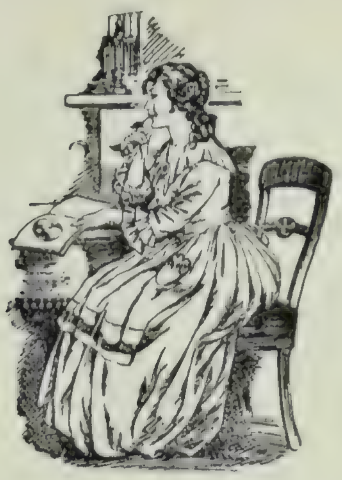

Jeremiah Flintwinch
(*Little Dorrit*)

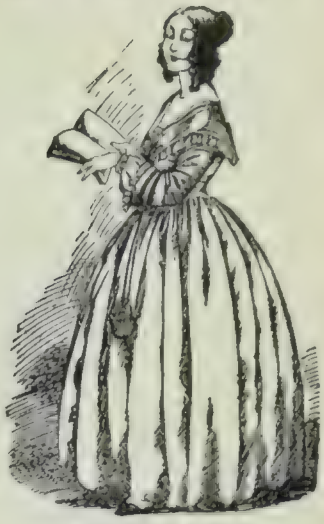

Mr. Pickwick
(*Pickwick Papers*)

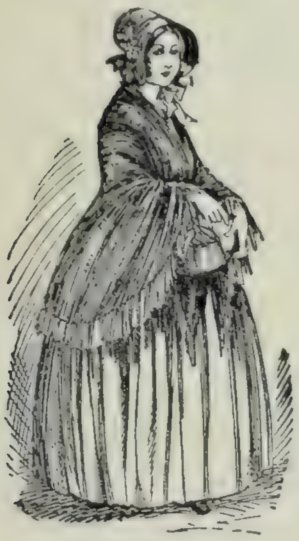
IMMORTAL CHARACTERS FROM DICKENS

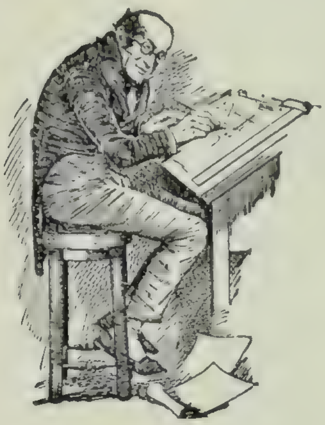

Dolly Varden
(*Barnaby Rudge*)

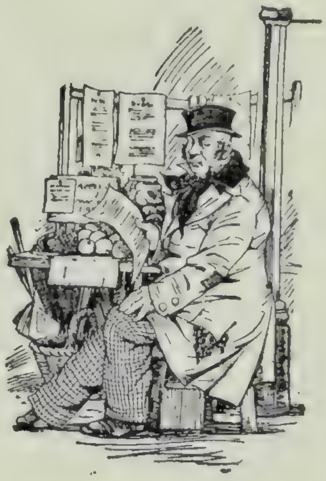

Bella Wilfer
(*Our Mutual Friend*)

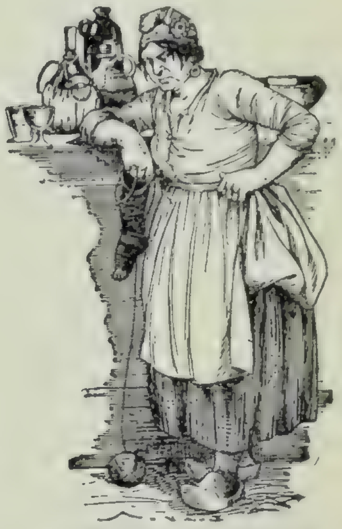

Rosa Bud
(*Edwin Drood*)

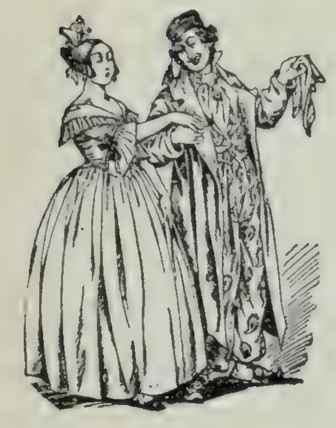

Agnes Wickfield
(*David Copperfield*)

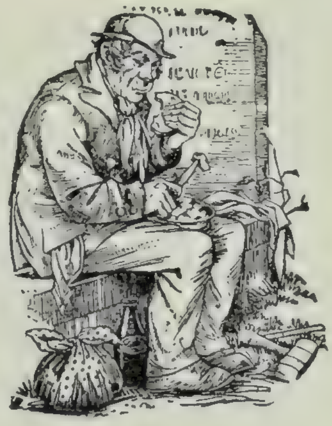

Little Dorrit
(*Little Dorrit*)

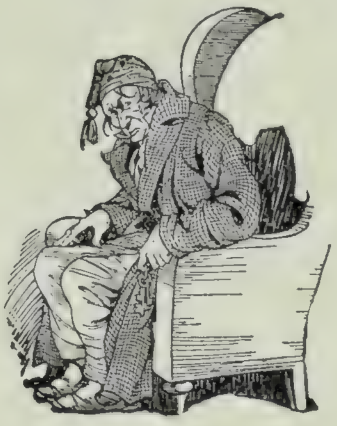

Tom Pinch
(*Martin Chuzzlewit*)

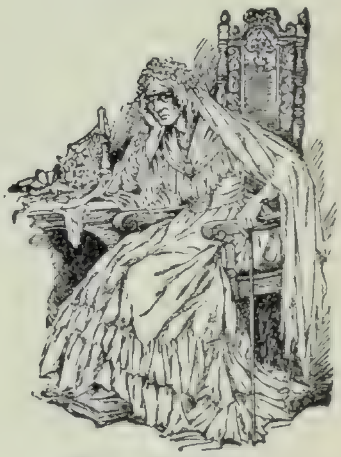

Silas Wegg
(*Our Mutual Friend*)

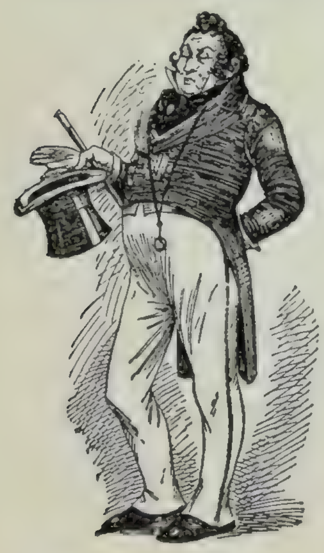

Madame Defarge
(*Tale of Two Cities*)

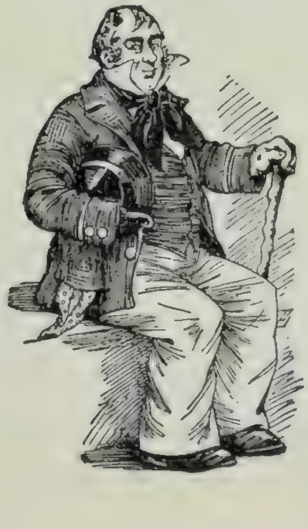

The Mantalinis
(*Nicholas Nickleby*)

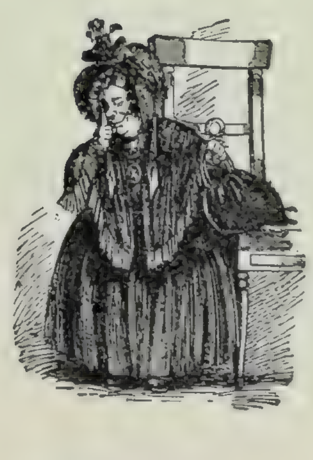

Durdles
(*Edwin Drood*)

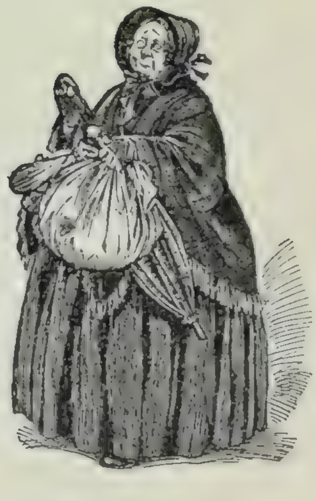

Ebenezer Scrooge
(*Christmas Carol*)

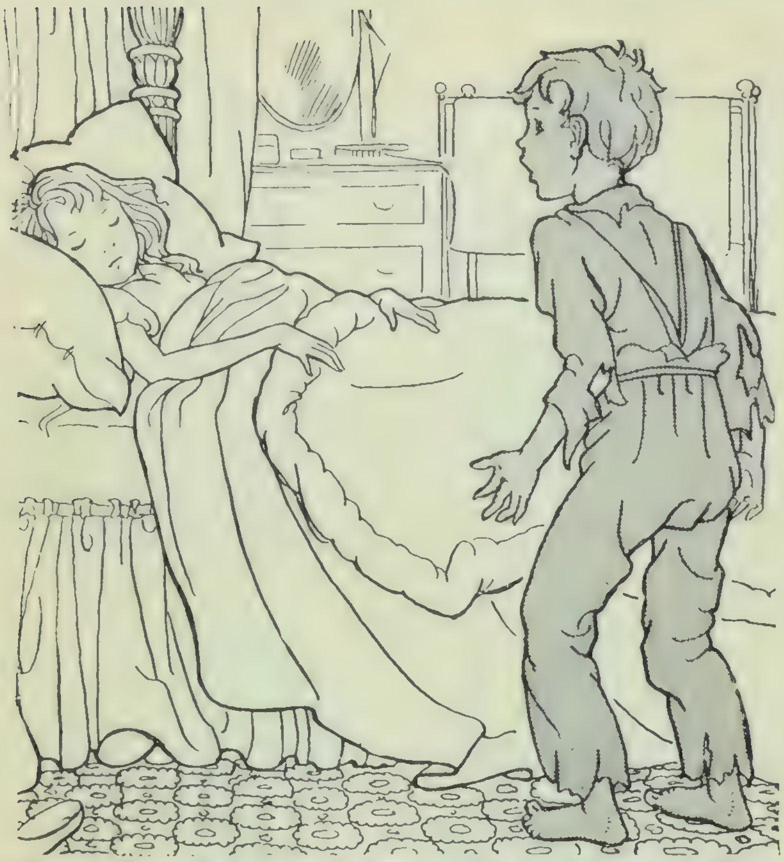

Miss Havisham
(*Great Expectations*)


Mr. Turveydrop
(*Bleak House*)


Captain Cuttle
(*Dombey and Son*)


Miss Mowcher
(*David Copperfield*)


Sarah Gamp
(*Martin Chuzzlewit*)



Young Tom, the sweep's boy, in Charles Kingsley's *The Water Babies*, comes down the wrong chimney and discovers Ellie—a beautiful young girl—asleep on her snowy couch, and is amazed at her purity and loveliness.

the other hand, tried to make his readers *think* ; and to most people it is not so pleasant being made to think as being persuaded to laugh. Hence came Thackeray's slow rise to success.

He was born in India, at Calcutta, where his father was in the Civil Service, and was sent to England to be educated, to the famous public school of the Charterhouse, which was founded upon an ancient monastery of the Grey Friars in London.

One of Thackeray's chief characters, called Colonel Newcome, dies as an old pensioner in Grey Friars.

THACKERAY, WHO MADE MANY PEOPLE LAUGH WITH HIS AMUSING STORIES.

Like Dean Swift, Thackeray was a satirist, though in a much less degree. He sought rather to banter people, and make them laugh at themselves. This was done mainly through the pages of *Punch*, the well-known humorous paper.

Perhaps the book that young people like best is the delightful fairy tale called *The Rose and the Ring*. He wrote it for a children's Christmas party, calling it " A Fireside Pantomime," and illustrated it himself.

Thackeray's greatest satire is a very long story called *Vanity Fair*, which came out in 1847. The title was taken from Bunyan's *Pilgrim's Progress*. Thackeray uses these words for the useless, idle, almost criminal kinds of people who are to be found in all classes of society.

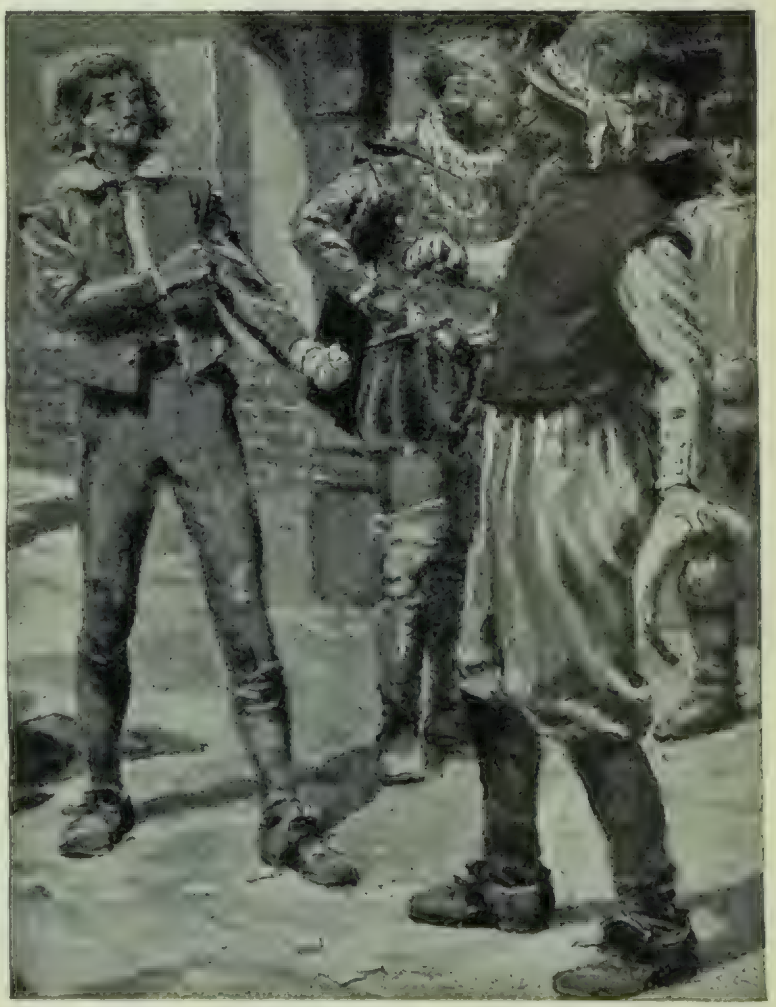
All his later books were long. His stories were not clearly told, yet his books always pleased those who liked a wise and clever way of looking at the world.

He wrote a kind of autobiography called *Pendennis*. To Thackeray, Pendennis is the same as David Copperfield is to Dickens. We know little more about Thackeray's private life. Before he died, he let it be understood that his private papers should not be used to make a biography, and those wishes have been largely followed.

He was found dead in his bed on Christmas morning, 1863, and his friend, Charles Dickens, wrote a splendid article about him.

GLORIOUS DEVON WAS THE SCENE OF KINGSLEY'S BEST BOOKS.

It is said that every place, sooner or later, finds the right man to write about it. Devonshire found its man about the middle of the nineteenth century, and his name was Charles Kingsley. As a boy he wandered about this region, where his father was a clergyman, and here he placed his best story, which is one of the greatest adventure books in our language, and is called *Westward Ho!* This story deals with the grand old days of Queen



Young Amyas Leigh, the hero of Kingsley's *Westward Ho!* rouses Captain Oxenham's admiration by offering to fight him with his fists. The book is full of incident.

Elizabeth's reign, when Drake and other sea-dogs were opening up the New World to the wondering gaze of the Old.

Another of his books which should be read by every boy and girl is *The Water Babies*, a fairy story. The chief character is a chimney-sweep, a boy called Tom, who became a Water Baby, with full freedom in the Water World. He travelled far and met with many amazing adventures.

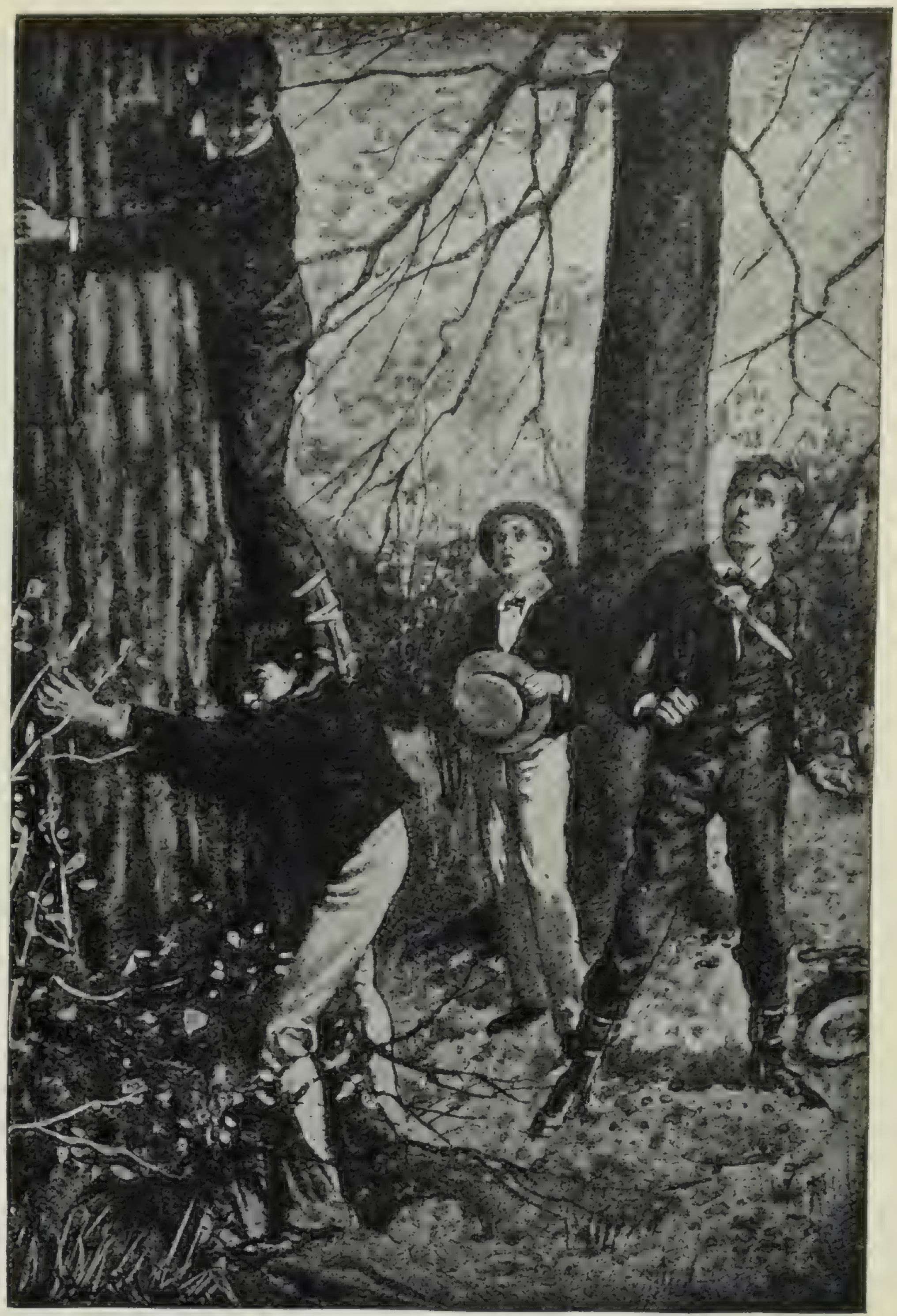
Kingsley wrote another book which is read by most boys and girls. It is called *The Heroes*, and tells in splendid style the old Greek stories of Perseus and other famous warriors.

WHY HAS "TOM BROWN'S SCHOOL DAYS" REMAINED SO POPULAR?

Probably the first of all school stories was *Tom Brown's School Days*. The author, Thomas Hughes, was a friend of Charles Kingsley; he was a successful lawyer; but in many ways of thought he was very like Kingsley.

The story of *Tom Brown's School Days* hardly needs to be told here. The real story begins at Chapter V., where Tom arrives at Rugby School. After that we have a good yarn of his progress through the school until he arrives at the Sixth Form and the Cricket Eleven.

The important part of *Tom Brown's School Days*, and one that you should notice the very first time you read it, is that it set the fashion for all school stories that came after it. It was published as long ago as 1857, so in point of time it comes first. Now, if you compare *Tom Brown's School Days* with the other school stories you have read, you will at once see the resemblance between them. For this reason *Tom Brown's School Days* is important historically: it began a whole literature of school stories.



Do you remember reading in the popular tale, *Tom Brown's School Days*, how Tom and his companions went bird-nesting? If so, you will recognise this picture. This book set the fashion for school stories.

HOW THREE FAMOUS SISTERS STRUGGLED TO EARN THEIR LIVING.

We are now going to turn to one of the most remarkable families in the history of our literature. They are three women writers, all sisters, Charlotte, Emily and Anne Brontë.

The Brontë country lies in the bleak moorlands, between Yorkshire and Lancashire, on the slopes of the Pennine Range. And here, in the little Haworth parsonage, lived the Reverend Patrick Brontë and his family.

Of his six children, three showed great ability as authors, and these three were Charlotte, Emily and Anne, who, along with their brother, Patrick Bramwell Brontë, were all born near Bradford, in Yorkshire.

Their mother died within a year of going to Haworth (in 1820), and the two eldest children soon followed her to the grave. Charlotte was now the eldest living member of the family.

The life of Charlotte Brontë was not happy. Her father was often short-tempered, and he lived beyond his little salary.

After the girls had left school, they had to seek some way of earning their living. There was really only one occupation open to them, that of teaching, and in order to make herself qualified for the post of language mistress

Charlotte went to Brussels, where she spent a lonely year or two as a governess in a school.

When she returned to Haworth the three sisters issued a little advertisement, saying they were prepared to take in young ladies as pupils, but not a single pupil came their way. Then they compiled a book of poems, but this other attempt of theirs failed also.

HOW CHARLOTTE BRONTË WROTE OF HER OWN LIFE IN "JANE EYRE."

Charlotte was not daunted. She had written a story called *The Professor*, and this she now sent to publishers in London. At length, one firm suggested that *The Professor* was hardly long enough. They asked Charlotte to lengthen her novel; but in reply she sent them a completely new one, *Jane Eyre*, which was published in 1847, and in a short time Currer Bell (as she called herself) was the most famous author in England. To a large extent *Jane Eyre* is the story of her own life. It is written so earnestly and vividly that it is among the best novels in the language.

Her success helped her two sisters. Emily, the youngest, wrote a story called *Wuthering Heights*, a wonderful tale for such a young girl, and in places almost better than Charlotte's *Jane Eyre*. Anne, the second youngest, had the least ability. Her two stories, *Agnes Gray* and *The Tenant of Wildfell Hall*, are not nearly so good as those of her sisters.

At the very time that Charlotte should have been happiest, sorrows came thickest. Her brother died in September, 1848; Emily died in December of the same year; and Anne died in May, 1849.

In 1854 she married her father's curate, Mr. Nicholls, but within less than a year of her marriage she died, and lies buried in Haworth churchyard beside her mother, her brother, and Emily.

IF YOU LIKE SEA-STORIES, YOU WILL BE INTERESTED IN THESE AUTHORS.

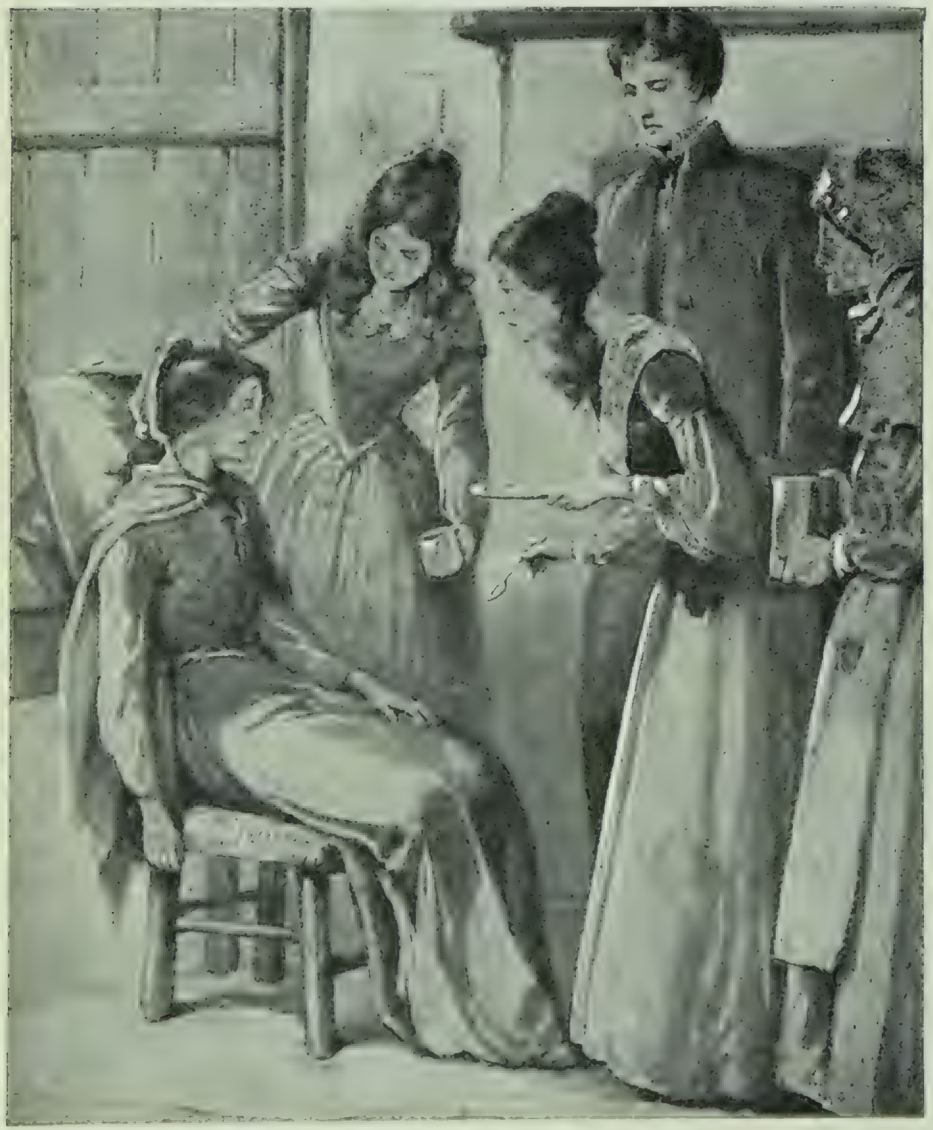
The real father of sea stories was a certain Tobias Smollett, who was born in the West of Scotland in the year 1721. Smollett was a doctor in the navy, and saw active service in many parts of the world. His first book, *Roderick Random*, which was published in 1748, was the parent of a line of books of the same kind.

It is very doubtful if you could read Smollett's books with much pleasure. They are written in a coarse manner. We must not blame Smollett for that, because he is only finding out a method that later writers were to improve upon.

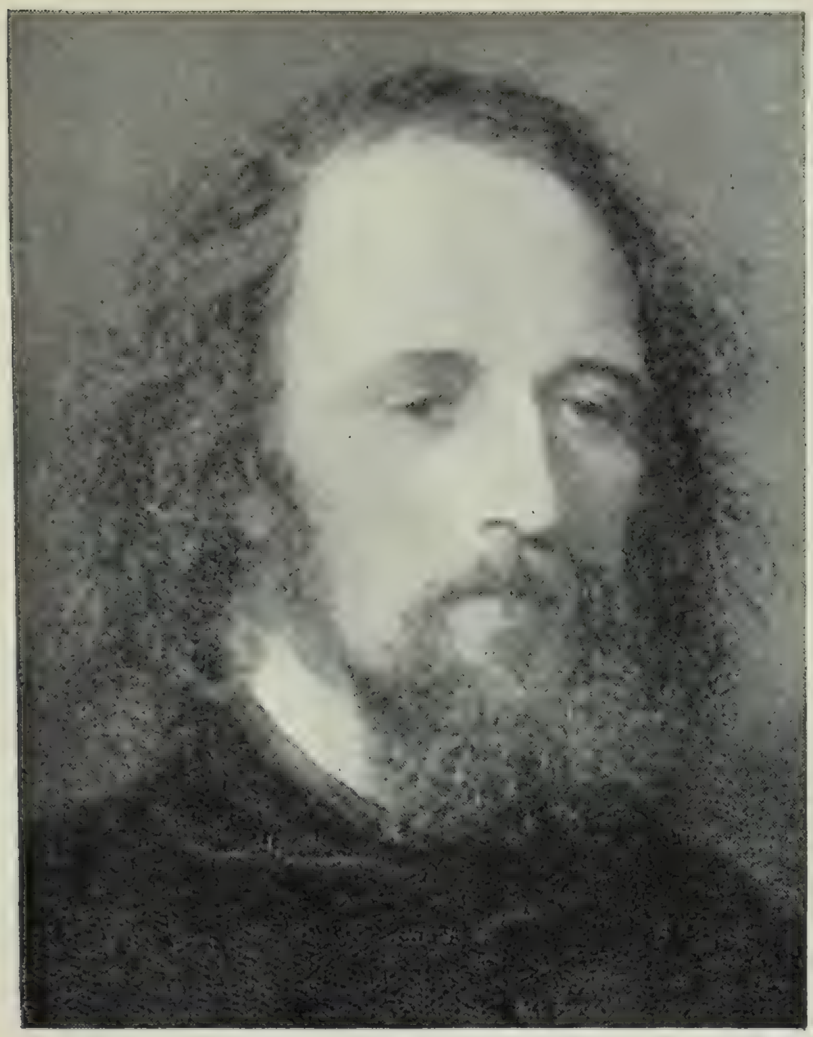
THE MAN WHO WROTE MANY STIRRING TALES OF THE SEA.

A writer whose books can be easily read by modern boys and girls is Captain Frederick Marryat. Marryat had a lively career in the navy, and his books were equally lively. The best of his stories is usually said to be *Mr. Midshipman Easy*, which deals with the wars against Napoleon, though some readers prefer *Peter Simple*. Marryat also wrote a book in the manner of *Robinson Crusoe*. It is called *Masterman Ready*, and was written specially for boys.

Another writer of sea stories is Michael Scott, who, like Smollett, was born in the West of Scotland. Two fine yarns of the sea which still survive are his *Cruise of the Midge* and *Tom Cringle's Log*.



In *Jane Eyre*, Charlotte Brontë, describes her unhappy schooldays and relates to us some experiences of her own life. The picture shows Jane, who is destitute after her flight from Thornfield, receiving hospitality from her new friends.



Alfred, Lord Tennyson, was appointed Poet Laureate in succession to Wordsworth. He wrote many ballads and poems, and published his first drama when he was 66.

A really fine yarn is *Moby Dick,* by Herman Melville. Moby Dick is a mighty whale, a kind of phantom, known chiefly through rumours of the great destruction he has caused to whalers, and the story of his pursuit from sea to sea by an irate whaling captain makes one of the most exciting of all sea books.

The greatest of all English sea writers was Joseph Conrad, who died in 1924. For sheer love of the sea, and for glorious descriptions of tropical scenery, Conrad's books have never been equalled in English. His own career was a remarkable one. A native of Poland, his full name being Teodor Jozef Konrad Korzeniowski, he learnt English as a foreign language, entered the British merchant service, and rose to be a captain in that service. It is certainly wonderful that Conrad, who knew hardly a word of English until he was more than twenty years old, should learn to write the language so cleverly that no better English has been written by more than a dozen writers in all the long history of our literature.

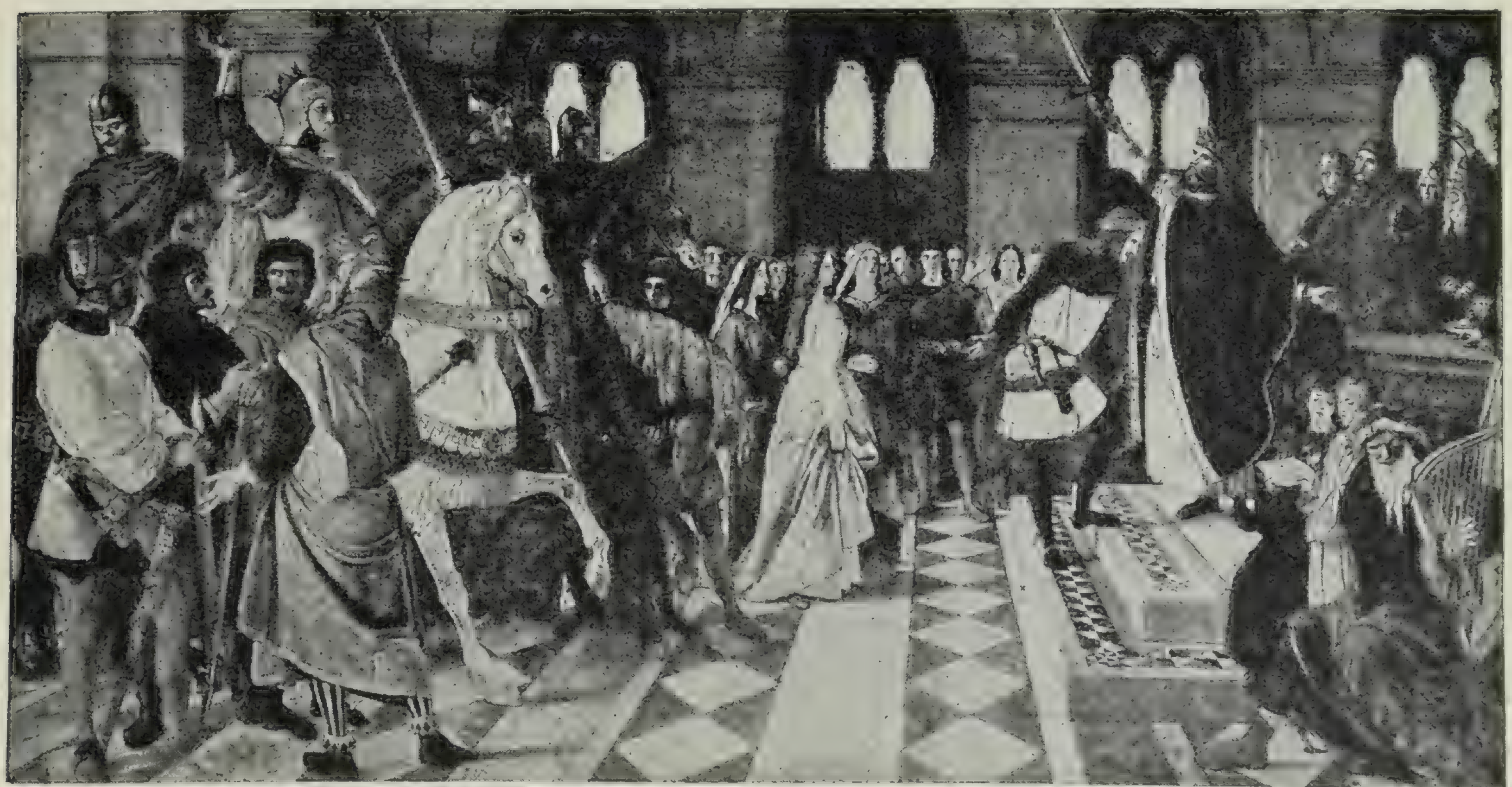
Of all his books, perhaps the easiest to read and understand is that called *The Nigger of the Narcissus,* while the best of Conrad's short stories appear in a volume called *'Twixt Land and Sea.*

HOW A BOY WHO WAS DETERMINED TO BE A FAMOUS POET REALISED HIS AMBITION.

Many famous writers lived during the Victorian period, but none were more famous than the two poets called Lord Tennyson and Matthew Arnold.

In all the history of our literature you will find no other poet who, like Tennyson, was actually made a peer in honour of his poetry, and no poet has ever been more popular during his lifetime.

The true secret of his success with the people lies in the fact that he wrote only upon



King Arthur and his Court—from Lord Tennyson's cycle of poems, "The Idylls of the King." The scene shows the admittance of Sir Tristram to the Round Table fellowship, that band of knights whose deeds are immortal.

English subjects. He loved to make up poems on English people and English places, and to express his thoughts in the purest of English words. For this alone he deserves to be honoured by all.

Tennyson was born in the year 1809, in Lincolnshire, where his father was a clergyman. From his earliest boyhood he had made up his mind to be a poet, and on going to Cambridge University he still kept to his intention to read and write poetry. At Cambridge, too, he met Arthur Hallam, with whom he grew very friendly.

HOW TENNYSON WROTE A BEAUTIFUL POEM IN MEMORY OF HIS DEAD FRIEND.

In 1833, when he was in Vienna, Arthur Hallam died suddenly. Tennyson was deeply touched by the sad death of his friend, and in 1850, seventeen years after the event, he published a very long, very sad, and very thoughtful poem in memory of his friend, calling it by the Latin words, *In Memoriam.*

During this same year, 1850, Wordsworth died, and Queen Victoria made Tennyson Poet Laureate in his place. Tennyson took his task seriously, producing among other poems a long ode on the death of the Duke of Wellington, as well as his famous poem on the charge of the Light Brigade.

The poet lived to a great age, dying in 1892 at his house of Aldworth, which he had built for himself near Haslemere, in Surrey. He was buried in Westminster Abbey. Tennyson's poems are noted for the music of the words. He wrote in verse the story of King Arthur, the *Morte d'Arthur* printed by Caxton hundreds of years before. This series of poems, *The Idylls of the King*, are gems of beauty, both in their word-music and their story.

Robert Browning wrote *The Pied Piper of Hamelin.*

Another Victorian poet whom we are to mention here is Matthew Arnold.

Matthew Arnold's father was nearly as famous as Matthew Arnold himself. He was Dr. Thomas Arnold, a clergyman who became headmaster of Rugby School.

It can easily be understood that Matthew Arnold's education was carefully looked after. He loved the works of early Greek and Latin writers, such as Virgil, Horace and Homer, and in nearly all his poetry there are signs of this great love of the classics. For example, his long poem, called *Sohrab and Rustum,* is told very much as Homer or Virgil would have told it, though, of course, it is written in English.

THE MAN WHO LED A BUSY LIFE BUT LEFT TIME TO WRITE POETRY.

Matthew Arnold wrote much poetry, though not so much as Tennyson, for he was busy with other affairs. His main work lay in education, and for thirty-five years he was an Inspector of Schools, and he was also a very good critic. In the course of time his different essays were collected and issued in book form, being called *Essays in Criticism.*

Thus he led a busy, useful, and varied life, and was respected as one of the foremost men of his age. He died in 1888, when he was sixty-six years old.

BROWNING EXPRESSED MANY OF HIS ORIGINAL IDEAS IN POETRY.

Of all the poets who have written within the last hundred years, no one has been more talked of than Robert Browning.

As a poet he was born, not made, and he had parents who encouraged the hopes and ambitions of their only son. At first he had dreams of writing great plays and becoming another Shakespeare. In this he had the help of a famous actor of that time, called Macready. For Macready he wrote several plays, but none of them was very successful. The best of them is a historical drama called *Strafford.*

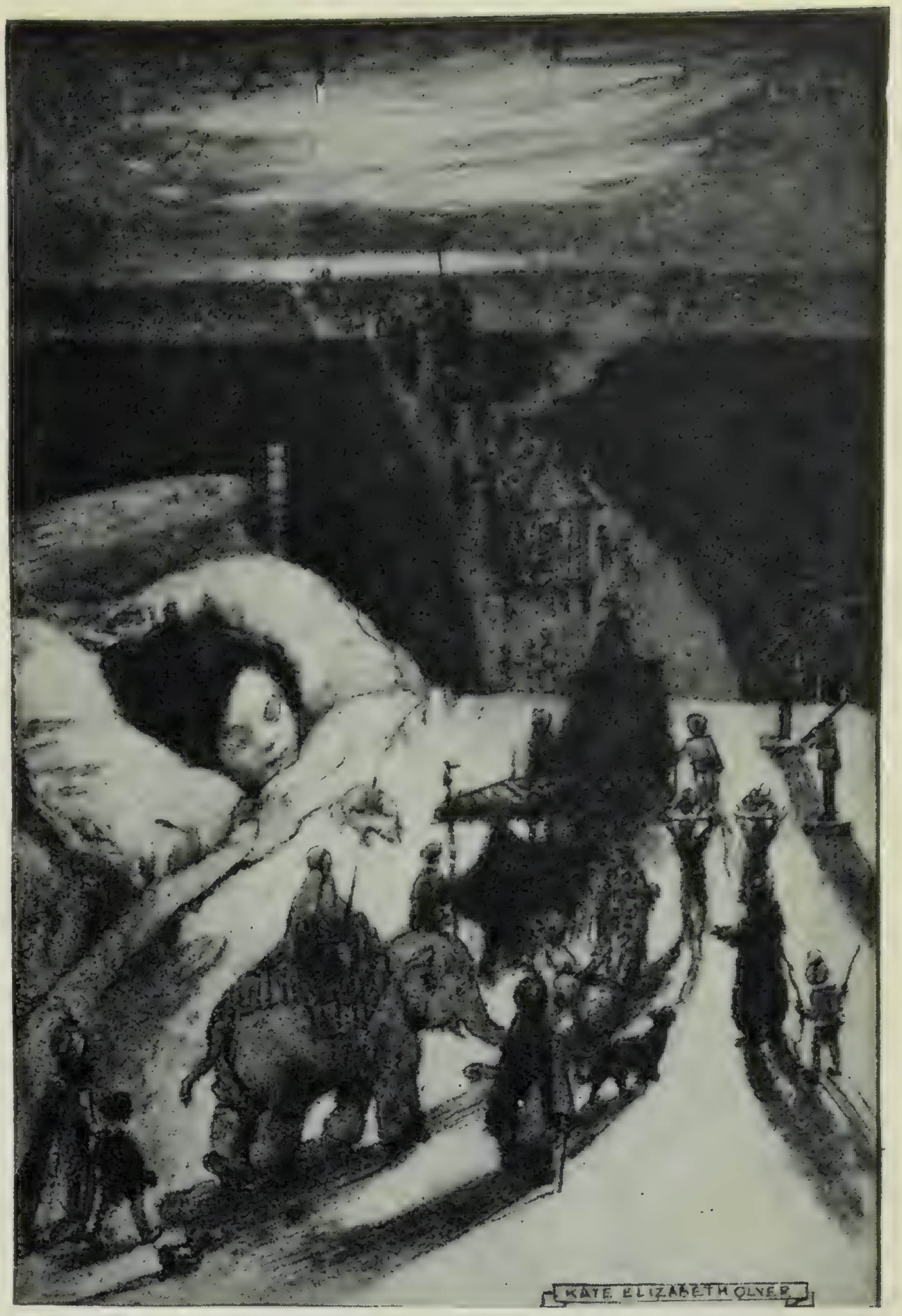
After this he turned more and more to poetry, writing books in great numbers. Many of Browning's readers could not understand what he wrote. He was trying to express new ideas in a new way; and, as so often happens with those who have new ideas, people would not understand what he meant.

His poems soon brought him at least one admirer, and one who henceforth was to occupy the chief place in his life. This was a popular poetess called Elizabeth Barrett. When they met, so great a tenderness sprang up between them that Browning asked her to marry him. Though she was several years older than the poet and almost a cripple, she was married to Browning secretly, and they hurried away to Italy. Their favourite home was near Florence, the scene of many of Browning's poems. There, sad to say, his wife died, after fifteen years of the happiest married life.

When Browning died, twenty-eight years after his wife's death, he was buried in the Poets' Corner in Westminster Abbey.

Most of Browning's poetry is not suited to the taste of young people, but one or two pieces are popular with the very youngest. Who has not heard of his *Pied Piper of Hamelin*? It was written for little Willie Macready, the son of the actor; and it tells how the town of Hamelin was plagued with rats.

The poor mayor and corporation are worried out of their wits in trying to rid the town of the plague, when the piper appears at the meeting and hears their story.



A Child's Garden of Verses, by Robert Louis Stevenson, has fascinated many readers, young and old. The above picture shows the magic world in which a little child moves when asleep.

HOW THE PIED PIPER DROVE THE RATS FROM HAMELIN.

For a thousand guilders he offers to clear Hamelin of rats. The corporation agree to this, and so, taking up his pipe, he sets about his task, and charms the rats into the River Weser.

As the stupid mayor will not give him his payment, he charms all the children away (except one lame boy), just as he had done the rats, and they all disappear into a cavern in a hill. It is a wonderful story, brilliantly told.

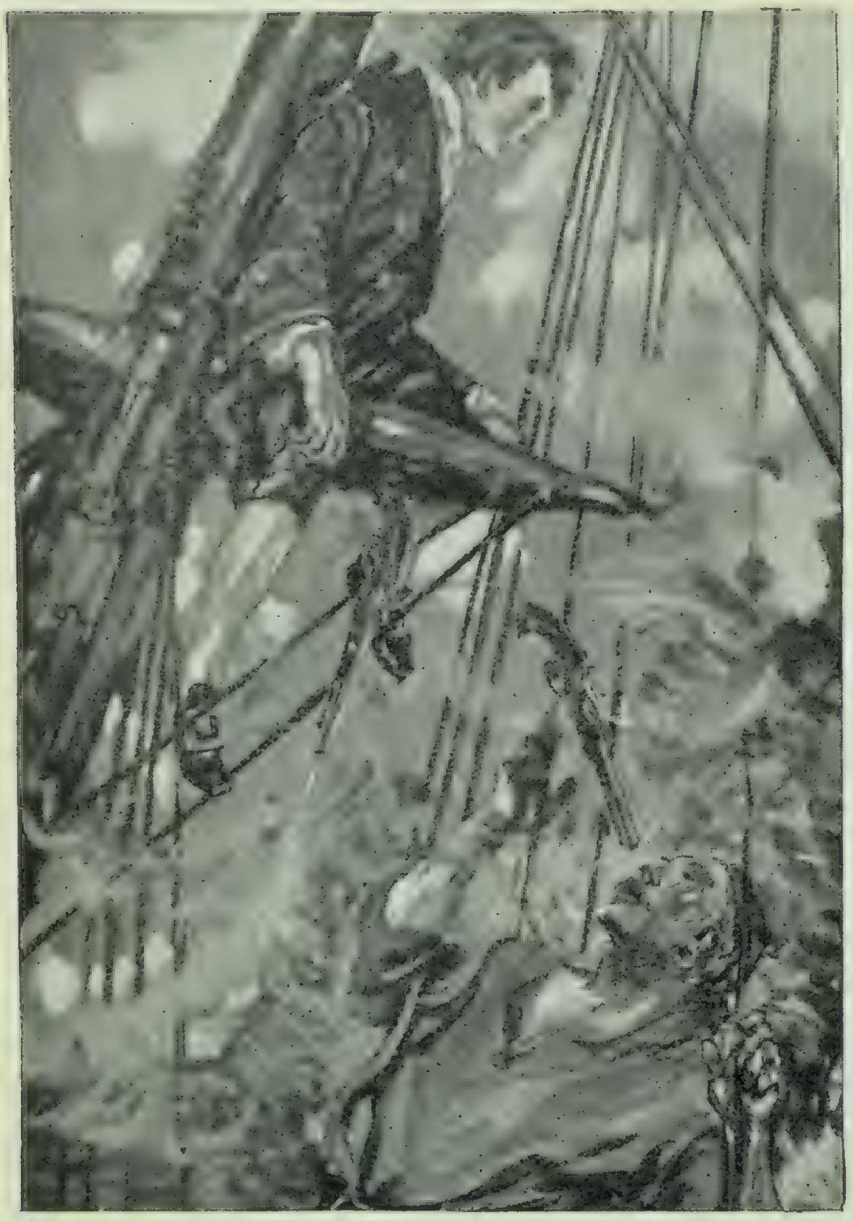
Other poems which you should read are his stirring piece entitled *How they Brought the Good News from Ghent to Aix*, and his fine poem—*Home Thoughts from Abroad*.

The love of natural history, like the love of the sea, is a healthy one. One of the best books on natural history was written by Gilbert White, a clergyman, and was issued in the year 1789. Gilbert White was born at the little village of Selborne, in Hampshire, and in later years he was a clergyman in his native village. He had the keenest eye for all kinds of natural objects—for birds, beasts, and flowers, but especially for birds.

He had no fewer than four brothers who were all nearly as keen on natural history as he was, and Gilbert used to write them long letters about what he had seen. This led him into writing to other naturalists, and so a large amount of material gradually grew up. This appeared in book form as *The Natural History of Selborne*, the first great book of its kind in English.

THE MAN WHO WROTE ABOUT STRANGE PLACES AND QUEER CREATURES.

If we pass over nearly a hundred years we come to the greatest naturalist in English, and one of the greatest of all time. He is called Charles Darwin. He wrote many wise and deep books, but there is one that can both



An exciting incident in Robert Louis Stevenson's stirring tale, *Treasure Island*, when a dagger pins the hero to the mast, and his pistols go off, sending the coxswain headlong into the water. Have you read this wonderful story?

amuse and instruct younger people, and that is *The Voyage of the Beagle.*

If you read this book you will be taken into many strange quarters of the world, and will learn many queer things about the people, animals, birds and plants.

After Darwin we pass on to Richard Jeffries, whose father was a farmer in the south of England. There is no better observer of the English field and hedgerow than Richard Jeffries. His best nature books are *Wood Magic, Wild Life in a Southern County*, and *The Life of the Fields.*

SOME AUTHORS WHO HAVE WRITTEN TALES ABOUT ANIMALS.

One of the most recent of English naturalists, and one of the very best, is W. H. Hudson. He was born on the pampas of South America, about which he writes some of his most delightful sketches. His best book is probably *Green Mansions.*

Of the class of books which illustrate natural history by telling stories about animals, we shall mention only two books, but they are very good ones. The first is called *The Wind in the Willows,* by Kenneth Grahame. It is one of the sweetest and daintiest books of its class, and yet it is full of life and glee.

The other book to be mentioned is probably already known to most readers of this book. It is the *Jungle Book,* by Rudyard Kipling, which tells the story of Mowgli, the little Indian boy who was reared by wolves. Once you have read about Shere Khan, the tiger, and Baloo, the black bear, and Kaa, the big snake, as well as the many others, you will not easily forget them.

HOW R.L.S., WHO LOVED ADVENTURE, WROTE MANY STIRRING TALES.

Robert Louis Stevenson was born at Edinburgh in 1850. His father was a builder of lighthouses, and during his school holidays young Robert used to go with him to the different places where they were working upon lighthouses, and in this manner he acquired that intense love of the sea which is so clearly seen in all his stories.

Other holidays were spent at Swanston, a romantic spot in the Pentland Hills, near Edinburgh. There he learned to love the moors and the wide spaces of the hills.

These memories, and others connected with his childhood, are to be found in a book of charming poems, which he published much later, called *A Child's Garden of Verses.*

STEVENSON WENT ON MANY VOYAGES OF ADVENTURE IN DIFFERENT LANDS.

Stevenson might have been a civil engineer, like his father, but his health was always so weak that the life was too much of a strain. He thought, therefore, of becoming a lawyer, and actually qualified as one, but in the end he had to give up all idea of a settled occupation. He crossed to France, bought a donkey, and wandered about in the beautiful wooded regions in the south of France. This kind of life he enjoyed very much; and it led him to write one of his first books, called *Travels with a Donkey.*

Besides his journeys in France, Robert Louis Stevenson took to roaming in Switzerland. In one of his journeys he met an American lady, whom he afterwards married.

But his health was now very bad. They tried living in Switzerland, and Marseilles also, but he hardly improved at all. For a time he stayed at Bournemouth, where his house was called Skerryvore, after the most stormy and desolate lighthouse round our shores. It was during this time that he wrote his stirring tales of *Treasure Island* and *Kidnapped*. Of all Stevenson's stories *Treasure Island* is the most popular. Of the others, *Kidnapped* is the most exciting. He also wrote a mystery story called *The Strange Case of Dr. Jekyll and Mr. Hyde*, one of the best of our " creepy " tales.

STEVENSON GOES ABROAD IN SEARCH OF HEALTH, BUT FAILS TO FIND IT.

While he was writing these stories, Stevenson's health did not improve, and at length he lost all hope of finding even moderate health in this country. He spent some time in the United States, where his books were very well liked, and then he hired a schooner and sailed from San Francisco to the South Sea Islands.

At last, after some years of wandering, the Stevenson family settled down in the loveliest of all the South Sea Islands, Samoa, where they lived for four years. Stevenson died suddenly in 1894, and was buried on the summit of the steep hill of Vaea.

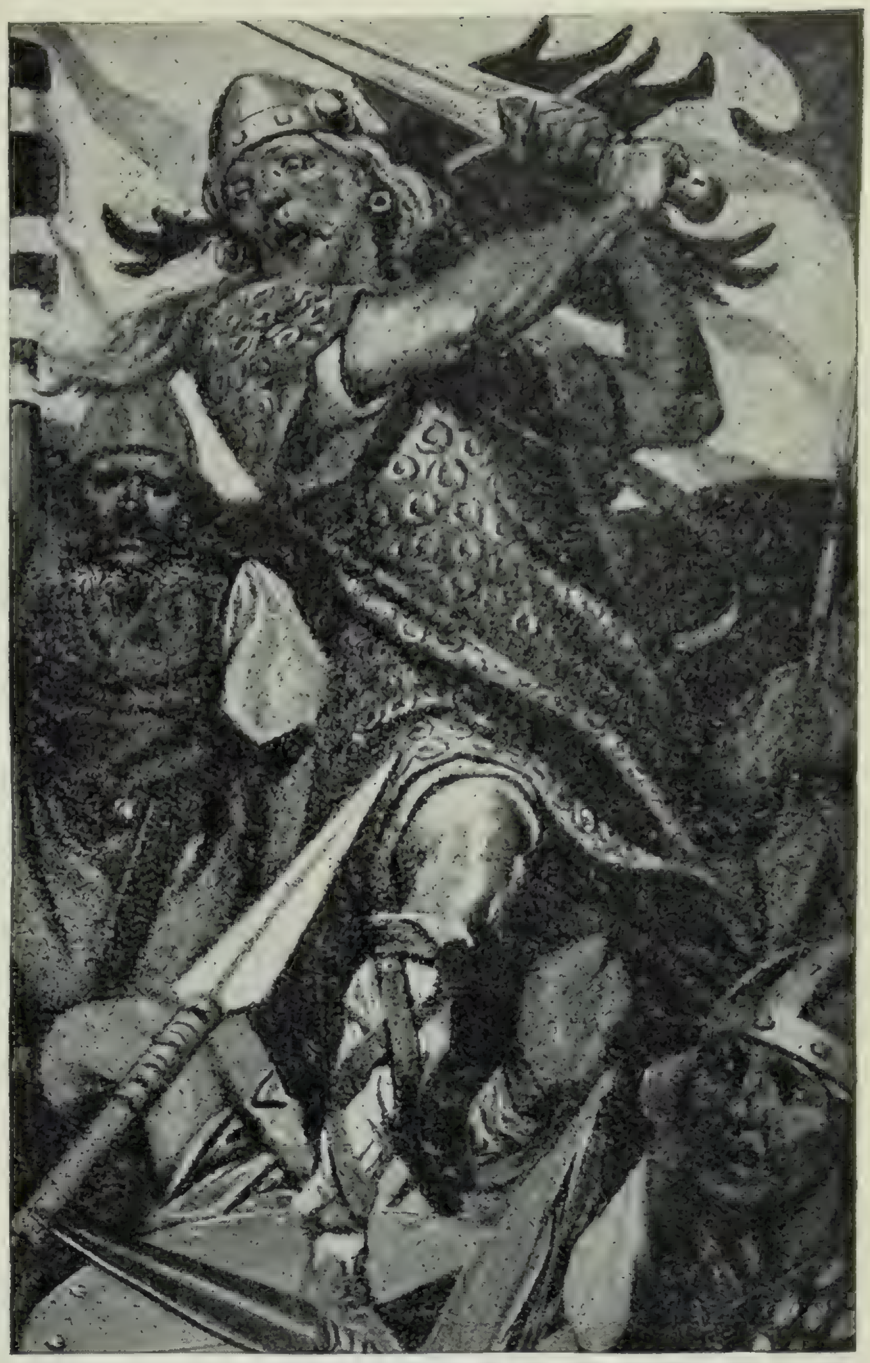
SOME ADVENTURE STORIES THAT FASCINATE READERS OF ALL AGES.

Let us tell you about some other adventure stories that you may like to read.

First, let us take Edward Bulwer-Lytton, who, in addition to being a popular novelist, was a peer and a man of fashion, a cabinet minister and a great speaker. His *Last Days of Pompeii* will take you to the days when Vesuvius broke out in eruption and destroyed two cities at its foot ; and his *Harold* deals with the fight against William the Conqueror. Lytton also tried a kind of scientific romance, calling his book *The Coming Race*. If, also, you want to read a very good ghost story, his tale called *A Strange Story* is one of the best.

After Lytton, let us pass on to Harrison Ainsworth. He wrote romances of a light, historical kind, such as *Old St. Paul's* and *The Tower of London*. His book *Rookwood* was recently reissued under the name of *The Bold Highwayman—Dick Turpin*.

And now we shall mention Richard Blackmore, the best of whose stories is *Lorna Doone*, which should be read by everybody. It tells you of the mysterious Doone Valley, which is situated in Devonshire and was inhabited by the sinister Doone tribe of outlaws. It is a story full of colour. Blackmore tells his stories with enjoyment, and thus makes his readers enjoy them too.


The last of the Saxon kings is the hero of Lord Lytton's well-known story, *Harold*. The picture shows the bold king urging his men onward to the fight with a stirring battle-cry.

THE MAN WHO WROTE MANY MYSTERY STORIES THAT ARE WORLD-FAMOUS.

With Henry Rider Haggard we come to quite recent times, for he died in 1927. His best books are set in Africa, and his great character is Allan Quatermain, an old elephant hunter, who is assisted by a gigantic Zulu called Umslopogaas. You will read of their adventures in *King Solomon's Mines* and *Allan Quatermain*. In *She*, still keeping to Africa, he attempted a kind of mysterious, supernatural story, and succeeded very well.

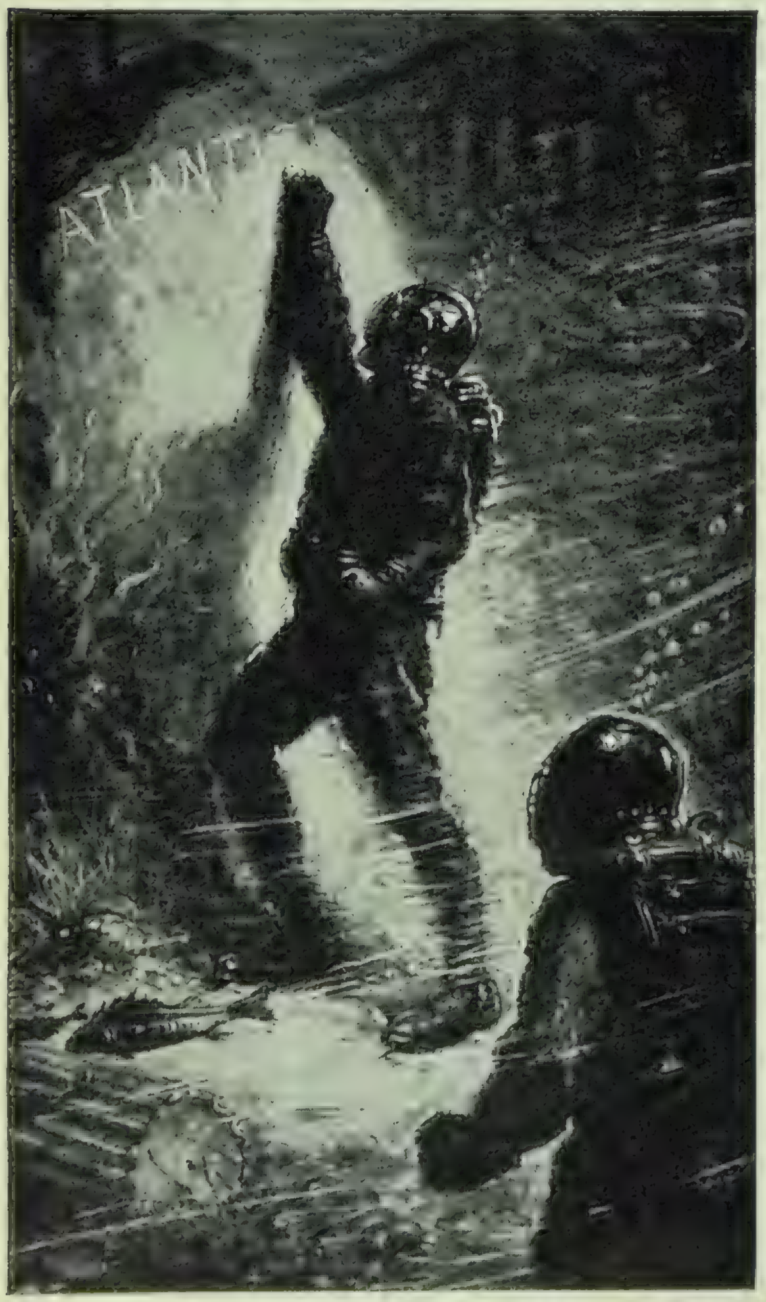
A novelist who began by writing stories in the style of Rider Haggard was Mr. John

Buchan, who, like Haggard, had some experience of African life. His *Prester John* is a fine yarn. In later years his stories have been set nearer home. He writes gracefully and fluently, as in the stories of *Greenmantle* and *Huntingtower*.

The writer who set the fashion in scientific romances was the Frenchman, Jules Verne, who died in 1905. His amazing stories, such as *A Voyage to the Centre of the Earth*, *Twenty Thousand Leagues under the Sea*, and *Around the World in Eighty Days*, make splendid reading.

HOW ALICE FINDS MANY ADVENTURES IN WONDERLAND.

A much better kind of scientific romance was written by the famous English novelist, Mr. H. G. Wells, whose books, *The Invisible Man*, *The First Men in the Moon* and *The Food of the Gods*, are not only fine adventure stories, but contain passages of splendid English prose and descriptive writing.



Many exciting happenings fill the pages of *Twenty Thousand Leagues Under the Sea*, by Jules Verne. Here Captain Nemo discovers the lost city of Atlantis.

We have already mentioned two first-rate fairy tales, and no doubt you will keep them in mind. They are Thackeray's *Rose and the Ring* and Kingsley's *Water Babies*. You will hardly ever find better stories than these.

Now let us say a little about *Alice in Wonderland*, by Lewis Carroll. The author's real name was Charles Dodgson. He intended to be a clergyman, but he was such a shy man, and he stammered so badly when he tried to read in public, that he gave up the idea and became a tutor at Oxford.

Alice in Wonderland is the story of a little girl who falls into a kind of trance and sees the most marvellous things. She pops down a rabbit-hole in pursuit of the White Rabbit, meets the Dodo, and the Mouse, and the Lizard, and other curious creatures. It is a queer, muddled, delightful book.

GREAT MEN WHO HAVE WRITTEN FASCINATING FAIRY TALES.

One of the most active modern writers of fairy tales was Andrew Lang, another learned man who took to composing fairy tales as a kind of mental holiday. He began with a collection called *The Blue Fairy Book.* This was followed by more fairy books named after other colours.

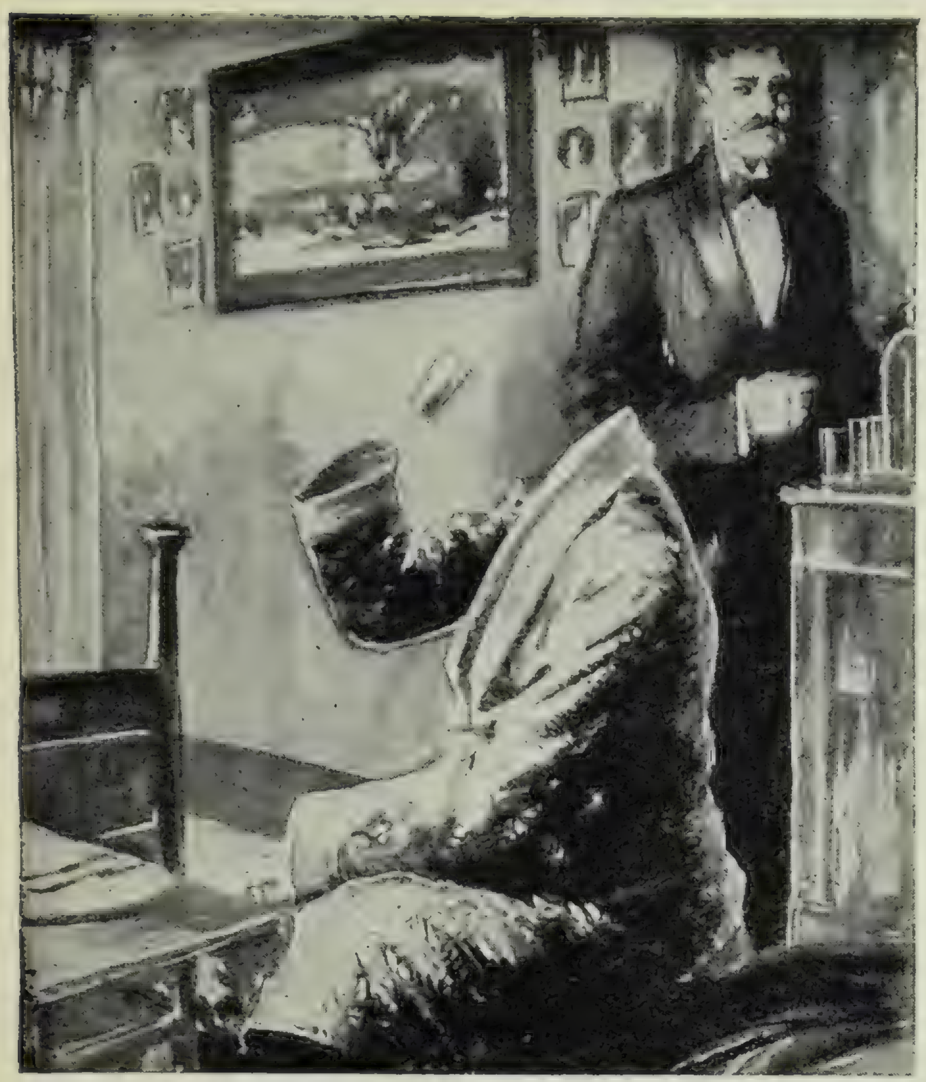
Another famous man who wrote an attractive fairy story was John Ruskin. He was a very famous writer, and wrote most beautifully about pictures and buildings. On one occasion he wrote a fairy tale, " at the request of a very young lady," as he says, and later on it was published. It was called *The King of the Golden River.*

THE YOUNG POET WHOSE FAME SPRANG ON HIM SUDDENLY.

Mr. Rudyard Kipling, writer of *The Jungle Books* and the school story *Stalky & Co.*, has written a fairy tale also, called *Puck of Pook's Hill.* The scene of the book is in Sussex, in the south of England, and you will be delighted with the descriptions of this beautiful district.

Now we shall deal with some Georgian poets. They are called Georgian because much of their poetry has been written in the reign of George V., who succeeded his father, Edward VII., in 1910.

One of the most famous of these is, perhaps, not one of the very best. His name is Rupert Brooke. He became famous, all of a sudden, in the Great War, and he became famous partly because he died in it, at the early age of twenty-eight. He wrote poetry of a boyish



H. G. Wells knows how to capture the interest of his readers, and in *The Invisible Man*, an incident from which is seen above, he gives us a striking example of his imaginative powers.

kind, rather wild and unusual in its style, but showing great promise for the years to come. He travelled abroad, too visiting among other places the South Sea islands, but he had to go back to Europe to work for his living, for he was not a rich man.

THE MAN WHO LOVED ENGLAND AND WROTE A BEAUTIFUL POEM ABOUT IT.

It was then that war broke out, and he volunteered as a soldier. He became an officer in the Royal Naval Division, and served in Belgium and the eastern Mediterranean. There he died of blood-poisoning, and was buried in the island of Skyros, within sight of the plains of Troy.

He seemed to have an idea that he would not return. Before he left England he wrote a short, sad, and beautiful poem, beginning:

If I should die, think only this of me:
That there's some corner of a foreign field
That is for ever England.

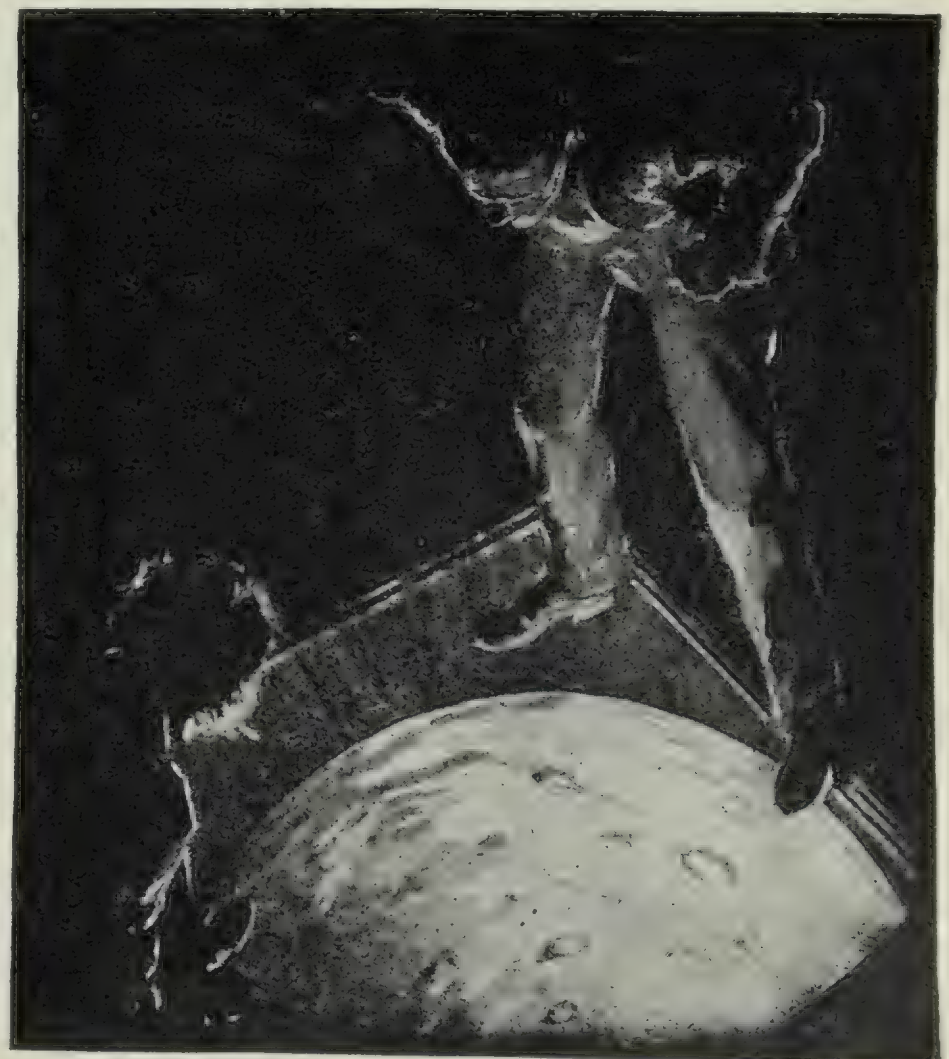
He goes on to say that where he is buried, there you will find England, for he loved her so, and was, as it were, part of her.

Another poet who loves England very deeply is Walter de la Mare. Nobody can better describe the peaceful English countryside, with its green fields, beautiful flowers, and quiet homes.

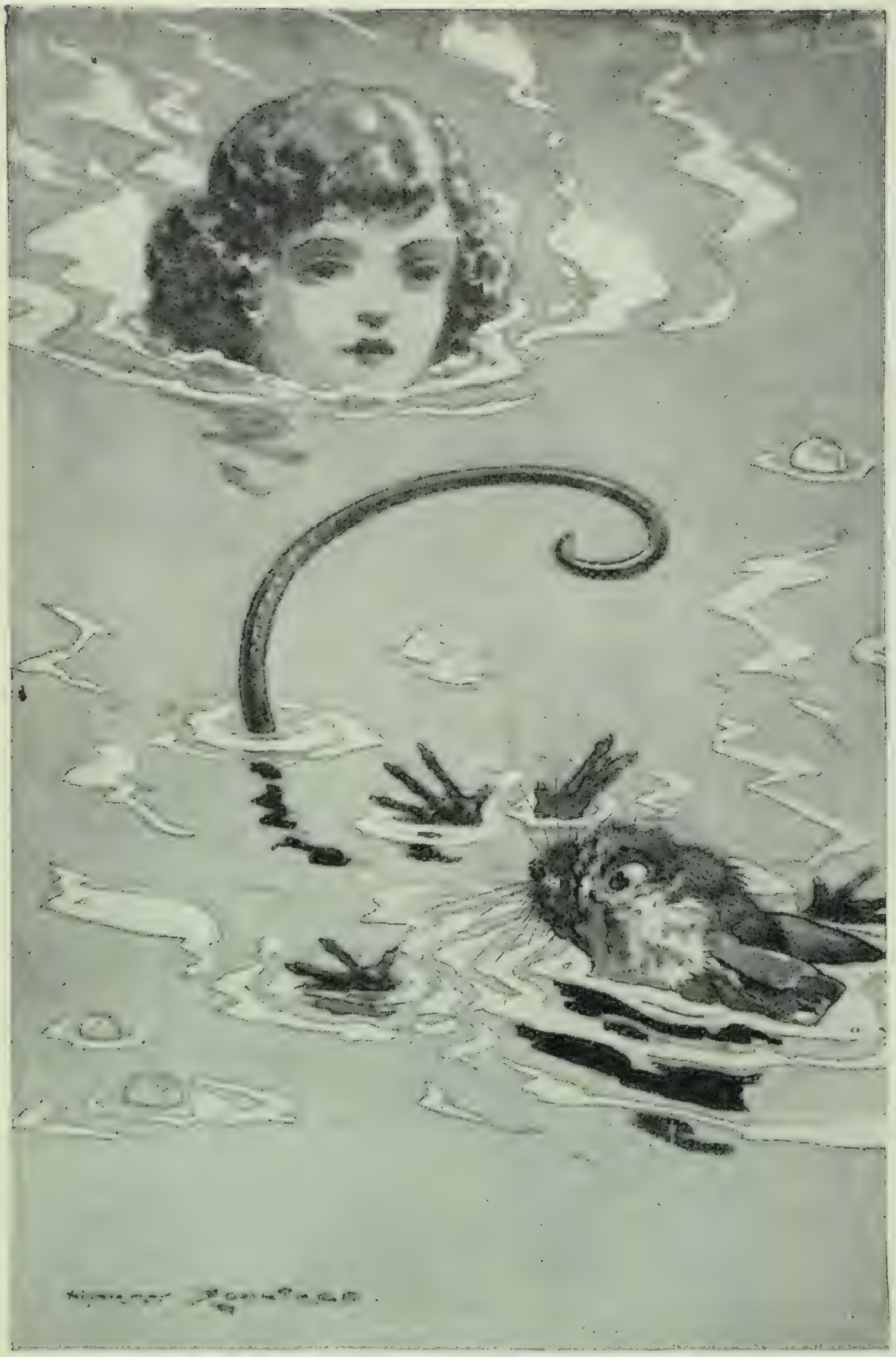
THE TRAMP POET WHO ROAMED THE COUNTRY, PLAYING AND SINGING.

As a poet of a different sort, let us mention William Henry Davies, who was born in the year 1870. Davies had some very strange experiences. To begin with, he was a tramp and lived in the direst poverty. To earn a living he worked as a deck-hand on steamers that carried sheep and cattle from America to England.

Then he became a cripple. In this state he wandered through town and country, playing and singing for coppers, and living in common lodging-houses. But even in such a plight he rejoiced in the beauty of birds, and trees, and flowers; for he was a true poet. Afterwards certain well-known people came to know of his poems and they were published in book form. He wrote



A picture showing the adventurers looking down on the moon in that remarkable story, *The First Men in the Moon*, by H. G. Wells.



"What will happen next?" wonders Alice. We have all followed her adventures in Wonderland with deep interest, and are grateful to Lewis Carroll, who has described them for us in such a delightful manner.

an *Autobiography of a Tramp*, in which you may read of his many adventures, his thoughts when tramping and his outlook on life.

MEN WHO WROTE STIRRING POEMS OF THE ROLLING SEA.

Among the poets of the sea, one of the foremost is John Masefield, the present Poet Laureate, who for a time was a sailor. He sailed round Cape Horn—that wild and stormy region—in a clipper. His adventures are told in what perhaps is one of the greatest of all his poems, called *Dauber*.

You should read his poems *Sea Fever* and *Cargoes*, for they show his love of the sea and his vivid and skilful use of words. His love of fair play is seen in his remarkable long poem, *Reynard the Fox*, the story of a fox hunt from the fox's point of view.

Sir Henry Newbolt is also fond of writing stirring poems about life upon the sea. The doings of the early sea-rovers are described, as you will find, in his well-known poem called *Drake's Drum*, which most of you will have learnt off by heart.

Another poet who writes of the sea is Alfred Noyes. His principal work is a long poem about Sir Francis Drake, telling of Drake's voyage round the world.

THE IRISH POET WHOSE WORKS ARE QUOTED FAR AND NEAR.

We must include here a poet who comes from Ireland, that land of poets. He is William Butler Yeats, who was born in Dublin. He studied art until he was twenty-one, but later abandoned it for literature, and became one of our most famous poets. He wrote some beautiful plays about Ireland, but his best work lies in his poetry, which is given up to describing the beauty and wonder of his native country. One of his best-known short poems is called *The Lake Isle of Innisfree*, in which he describes the longing which suddenly sweeps over him whenever he thinks of this lovely place.

Of the many other poets of this time, let us consider one other, whom we select because his favourite subject was the romantic East. The name of this poet is James Elroy Flecker.

If you were to read his poem called *The Golden Journey to Samarcand*, you would hardly understand some of the curious words he uses to describe the customs of the country. It is very beautiful poetry, all the same, and has received great praise from many poets who have recognised Flecker's brilliance.

There is a feast of fragrant beauty jumbled together in this corner of a carefully-tended garden where masses of sweet-scented flowers lie smiling in the sun. It is easy, in such surroundings, to feel at peace with the world.

MAKE YOUR OWN GARDEN

A philosopher, who appreciated the beauties of Nature, once said that a house without a garden is like an egg without salt. It is very true that there is something essential lacking if our surroundings are not beautified by the fragrant mass of flowers so easy to cultivate. To watch a tiny seed being transformed into a sweet-scented flower fills us with wonder at the miracles wrought by Nature. Gardening, too, acts as a restful tonic on our minds, and gives healthy exercise to our bodies, and when we know that our handiwork is not being wasted, we find that it is not merely a useless hobby.

THERE is nothing more wonderful and exciting—is there?—than making things, and one of the most interesting and exciting things to make is a garden. For it is never finished. Of making and making it there is never any end.

The best time to start a garden is in the autumn or the spring, preferably the autumn, and the first thing to do is to dig up and prepare the ground. The digging should be done from the back, forwards, and before you begin to dig it will be better to take up any plants that may be already in the ground, and lay them to one side for the time being.

The best tool to use for digging, if your ground is empty of plants and bulbs, is a spade, as large a one as you can easily and comfortably use. For you must dig deeply if you want to make a really good garden, and a very small spade will not accomplish this. The object of this deep digging is to loosen and turn over the soil, making it ready for the roots of the plants, which go creeping in all directions under the ground, taking in food and water with which the plants can build up strong and healthy stems, leaves and flowers. So you see that digging is of very great importance.

"Two spits deep," is a very old rule for digging, and an excellent one to follow. It means that you should dig down to two depths of your spade. Starting a few inches from the back line of your garden, and at one side of it, thrust your spade into the ground as deep as you can, and throw the spadeful of earth that you dig up *forwards* against the wall or fence or other back boundary of your garden. Then put your spade in again *at the same place as before* and dig down to *another spade's depth,* throwing the earth you bring up forward on to the top of the other. You are now digging *two spits deep.* Continue in the same way all along the line to the other side of your garden, until you have a nice deep trench in front of you going right across it. Then go back to the other side and start digging again a few inches from the edge of the trench. The earth you dig up this time you will throw forward as before, filling up the first trench as you make another. Go on digging in this way until the whole of the garden has been dug up. The reason why you start digging at the back instead of in the front is that in this way you do not tread upon the newly dug earth, which would undo

A host of golden Croci make a welcome sight in the early spring when flowers are scarce. They grow wild on the Alps, and were introduced into Britain in 1605. [*Ryder*

much of the good done by the digging. By turning over the earth, air, light and moisture can more easily get into it, and you are bringing new, unused earth to the top for the new plants to grow in and sending the earth used last year down below to get a rest and so improve itself for the year to come.

When the digging is finished the ground should be left as it is for several days, except for putting back any plants you may have taken up. If you are digging in the springtime, and there are bulbs and young plants in the ground, it is better to dig with a fork instead of a spade, for then you can more easily dig around things without disturbing them.

THERE ARE MANY THINGS YOU CAN PLANT IN THE AUTUMN.

After your newly-dug garden has been exposed to the wind and sun and rain for a few days, you must next take a hoe and break up the large lumps of earth into small pieces, and you will find that they break up much more easily than when they were first dug up. Then with a rake you can remove any stones and bits of unbroken earth from the surface, after which your ground is ready for planting.

All sorts of things can be planted in a garden in the autumn. If you want a rose tree, now is the time to put it in, and it is possible to buy for a few pence a nice little dwarf rose-bush—or bushes—which will not take up too much room if your garden is not very large. You must dig a nice deep hole for its roots.

Bulbs, of course, must be planted in the autumn, and in good time, if they are to blossom early in the spring. Snowdrops and crocuses should be the first to go in as they are the first to come up. They are excellent for a border, and you could put them in alternately. Then come daffodils, narcissi, hyacinths and tulips, of which there are a vast variety of different kinds and colours to choose from. In planting your bulbs be sure to put them the right way in. The pointed parts where sometimes a pale yellowish-green shoot is appearing are the *tops*. Some bulbs have some fibrous roots showing at the bottom. For planting the bulbs, use a trowel or little fork for making the holes in which to place them a few inches below the surface of the ground. Do *not* use a stick for making the holes, for this is very likely to leave a space

The Scabious, or Pincushion Flower, is found in many different colours—blue, purple, crimson and white. The field Scabious grows in wild profusion and is a popular flower in Britain. [*Ryder*

A fragrant plot of large single Hyacinths in full bloom. Many of us treasure the bulbs so that we can grow Hyacinths indoors during the dark months of winter. [*Ryder*

between the bottom of the bulb and the bottom of the hole, and it is very important that your bulbs should be placed *resting firmly on the earth.* Then carefully cover them over with earth, and Mother Nature will do the rest. You will not need to water your garden during the winter. There is always plenty of rain and dew.

Some young wallflower plants, forget-me-nots, polyanthuses and pink and white daisies can all be planted in the autumn to make your gardens gay in the spring, and a delightful little plant to get hold of is the wanda. It is a sort of little dark purple primrose, and is remarkable for the marvellous rapidity with which it wanders all over a garden. Indeed, you will have to keep it well in check, and be often giving plants away to keep your garden from becoming all wanders. For every little wander plant will divide up into two plants in the spring, and each of these into two more in the autumn, and so on every year, and wanders also seed themselves! But it is one of the loveliest little plants to give colour to a garden in the spring-time.

The Erigeron makes a cheery bush of blossoms year after year in large, gay-coloured clumps. [*Ryder*

HOW TO PRESERVE YOUR PLANTS SO THAT THEY WILL BLOSSOM AGAIN NEXT YEAR.

If there should be any hardy perennial plants already in your garden, that is, plants that blossom year after year, like Michaelmas and large white daisies, phlox, and campanulas —there are many others—you may find some of the clumps are large and old enough to divide. To do this you must take up the whole clump, cut it into several pieces, and then plant these, if possible, in places where this plant was not growing at all before. In this way you will have strong, new plants to bear fine blossoms next year. If there are none of these hardy perennials in your plot of ground you will no doubt be able to get some pieces for your garden when big clumps are being divided elsewhere.

Other excellent hardy perennials are carnations, pinks and sweet williams, all of which should be planted in the autumn.

WHY NOT FOLLOW THESE INSTRUCTIONS AND MAKE AN ALPINE GARDEN?

If your piece of ground is large enough you can have a little rock or Alpine garden in one corner, and the autumn is the best time for making this. The plants you are going to grow here will be quite different from those in

Early flowering Tulips make a blaze of colour in a corner of this old-world garden. Those gay flowers were introduced into Britain from Holland. [*Ryder*

the rest of your garden. They are the sort that grow upon the sides of mountains, and even in the colder Arctic regions, where they are buried beneath the snow for months during the winter, and grow swiftly and with a profusion of blossoms with the melting of the snow and the return of spring. Now plants, like animals, adapt themselves to their surroundings, and these Alpine plants are for the most part very small and dwarf-like, never growing very high from the surface of the ground, so that they do not meet the full force of the terrific winds and storms that often scour the mountains. Many of them even are creeping plants, lying close to the earth, and clinging firmly to it with a number of strong, sturdy roots. We must remember these things when we are preparing a place in our gardens for these plants to grow. Another important thing to remember is that plants that grow upon steep and often rocky slopes will never have much moisture lying around them. Rain and melted snow quickly drain away down the mountain sides, and your rock garden, therefore, must be well drained also. And now for its making.

The Helenium Golden Beauty, with its pin-cushion heart and delicate petals, is an attractive addition to any garden. [*Ryder*

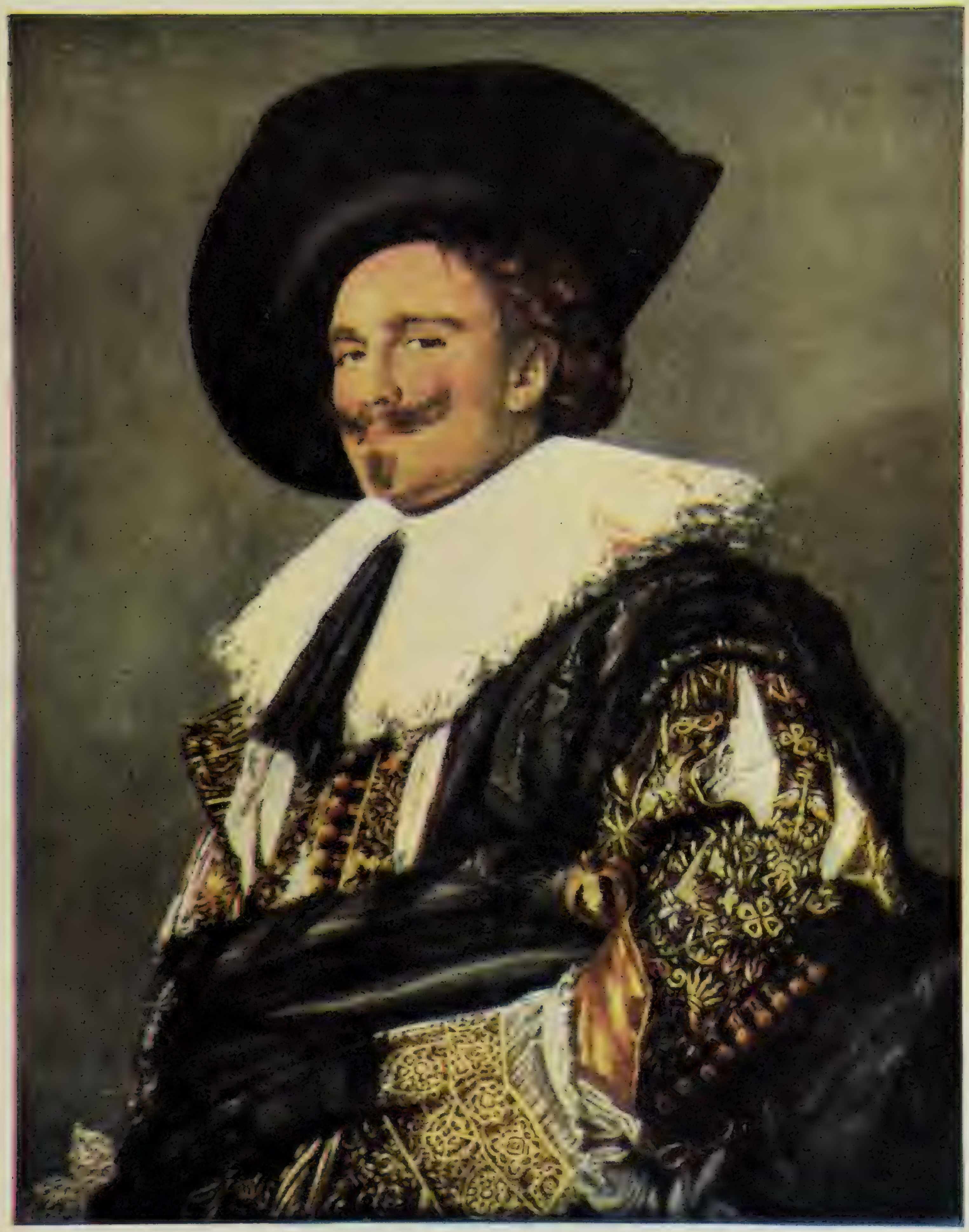
MAKING A ROCK GARDEN IS A FASCINATING PASTIME.

The first thing is to raise the rock garden rather higher than the level of the ground around it. A good way to do this is to make a little path running through it, and the soil that you dig out in the making of the path you should throw up on to either side of it. The path, also, should not all be on the same level. You should make it in the form of several little steps, rising one above the other, so that when it is finished you will have a nice sloping bank of earth on each side of it.

HOW TO MAKE YOUR ALPINE PLANTS FEEL AT HOME.

On the sides of the mountains there are many bits of rock and stone embedded in the earth. You must, therefore, have similar, although naturally smaller, bits of rock and stone in your rock garden in order that your Alpine plants may feel quite at home, and be given the best opportunities to grow well and happily. It should not be difficult to find them. Pieces of stone, clinker and brick are always to be found in a large garden, or in the fields and roads. When you have collected some suitable pieces, neither too large nor too small, the next thing is to place them into position, and this is a more important matter and needs more care than you might think was necessary. Indeed a great deal of the success of your rock garden depends on the placing of the "rocks" of which it is built. It is not enough just to place them upon the surface or lightly push them a little way into the ground.

For on the sides of the Alpine mountains the rocks are deeply embedded beneath the soil, with



THE LAUGHING CAVALIER.

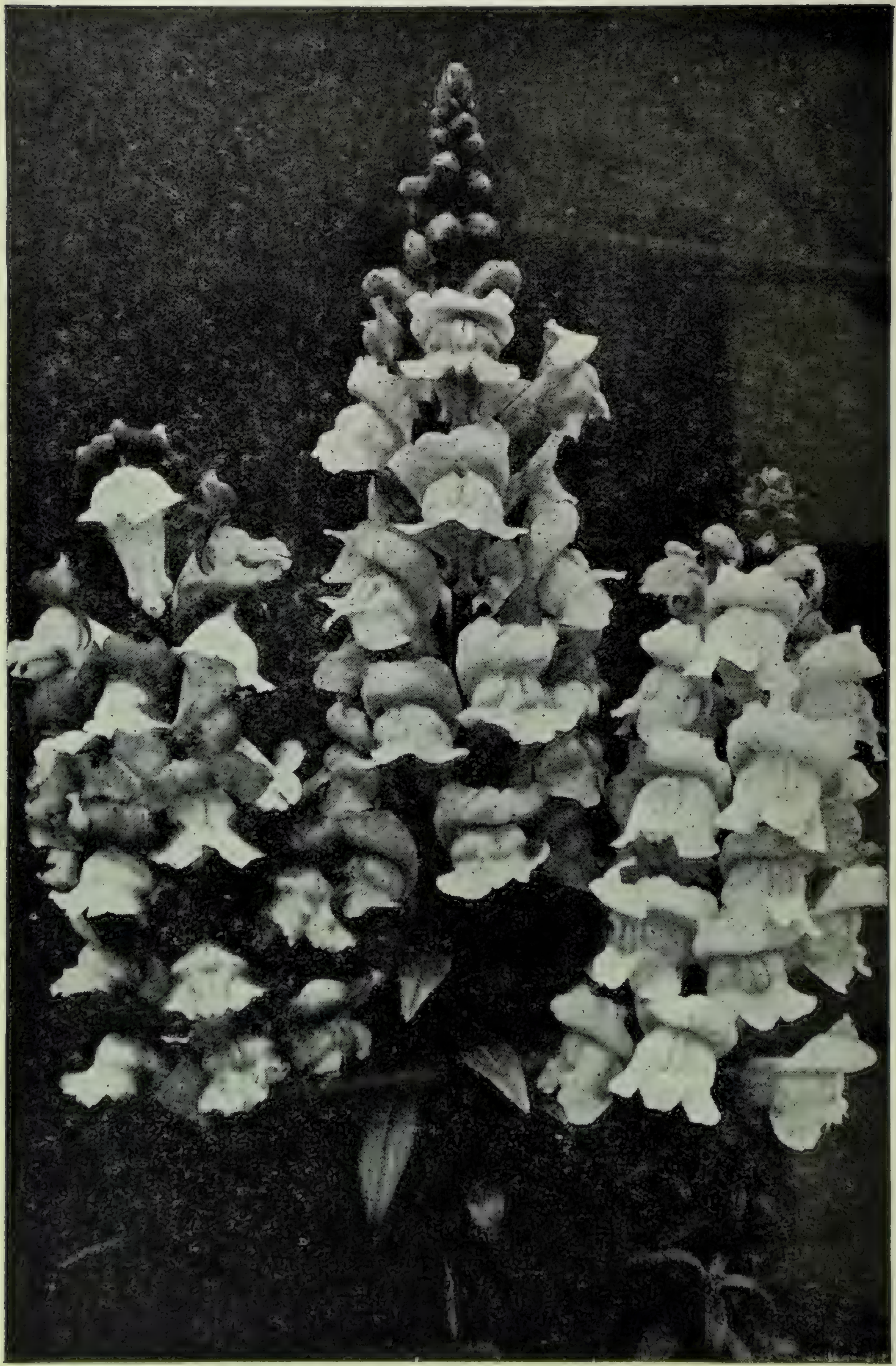
Wherever you move in the room the eyes of the Laughing Cavalier will seem to follow you. This is one of the most famous portraits by the seventeenth century Dutch painter, Franz Hals. *Facing page* [illegible]

" A GARDEN IS A LOVESOME THING, GOD WOT "

Does not this English garden delight you with its grace and charm? The lily pond, the shady paths that wind among the flowers, speak to us of peace and leisured happiness. Even the simplest of gardens is a joy for you to make.

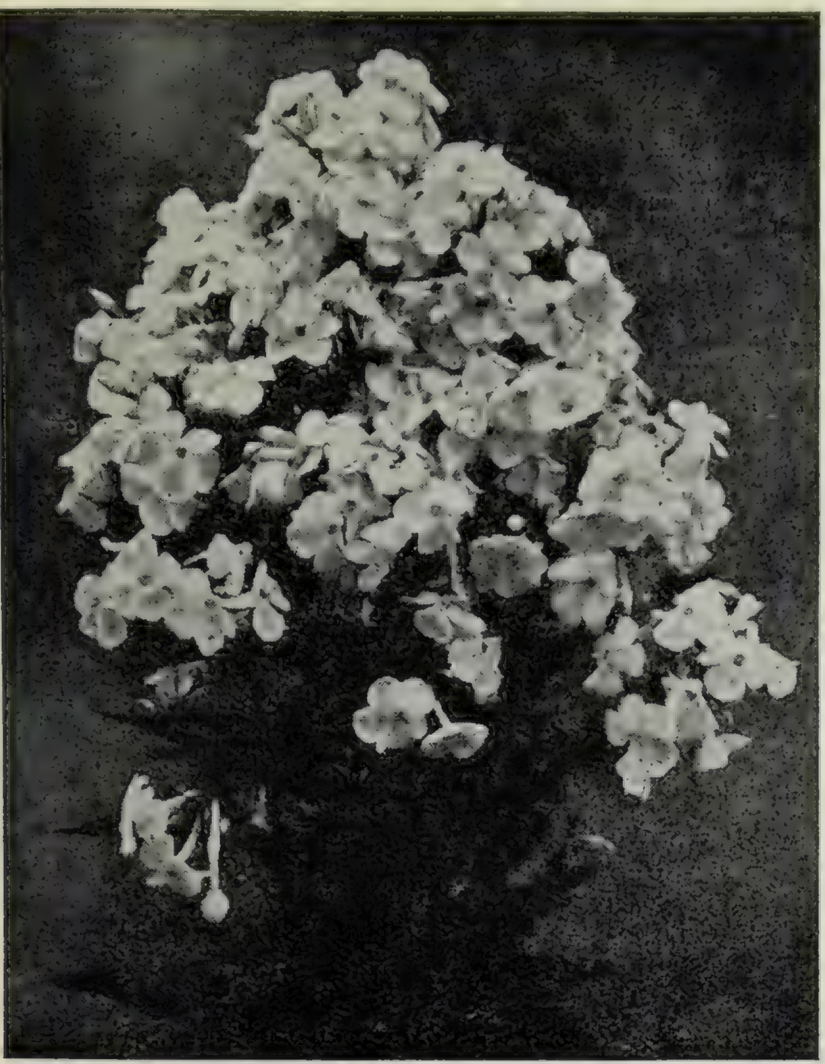
SPIRES OF MAJESTIC SNAPDRAGONS

Garden variety of a wild plant



Some of the flowers that we find growing, uncultivated, on the hedgerows and in the woodlands, delight our eyes more than the valuable plants in our gardens. The gay Snapdragon—a fine specimen of which is seen above—is becoming increasingly popular as a garden flower. Many varieties have been developed by the gardener, from tall plants of 3 to 4 feet down to dwarfs of 9 inches. [*Ryder*

A HANDFUL OF FRAGRANT FLOWERS



Do you recognise those dainty flowers that are easy to to cultivate? They are Phlox, natives of North America and Siberia, and favourite garden flowers in Britain. [*Ryder*

The Cyclamen, sometimes called Sowbread, is a half-hardy and greenhouse plant, with pretty pink, white, or purple flowers. It has a long stalk and large leaves. [*Ryder*

A fine display of gay-coloured Poppies. Numerous small seeds escape from the flowers and spread themselves in great quantities. Many specimens are found, some growing wild and tossing their scarlet heads in corn-fields. [*Ryder*

A BEVY OF BEAUTIFUL BLOSSOMS

A bowl of Anemones or Windflowers adds a bright touch to any room. There are many different species found in the temperate regions of Europe, some growing wild in the woodlands. They bear flowers of many brilliant hues. Anemones are hardy plants and if given plenty of moisture during early growth they will do well in your garden. [Ryder

The three flowers in the picture are popular specimens to be found in most gardens. There are Giant Pansies on the left, Stocks in the middle, and Border Carnations on the right. They are all easy to cultivate. [Ryder just parts of them appearing above the surface. You cannot, of course, put your stones and clinkers so deep down, and it is not necessary, but you should embed them firmly in the earth for several inches down, only allowing the tops to show, and with bare pieces of earth here and there between the stones to make your rock garden look, as much as possible, like the side of a mountain. Begin from the *bottom* of the rock garden and work upwards when you are placing your stones in position. If you have made a few steps in your path the slope of your rock garden will not be too steep, and you must be careful, when putting in the rocks, not to make one part of it too steep or like the walls of a house. If you do this your plants will die in the summer, for on too steep a slope the water will run away too quickly and leave the plants to wither for lack of moisture. Alpine plants do not like to lie in pools of water, but they do like enough water to take in when the hot days come. So, when your rock garden is finished, the stones and clinkers and bricks should all appear as little ledges, *not* as one steep wall of rock, and they should all slope slightly *backwards* so that the rain will run inwards to the plants, and not outwards away from them.

The next thing to be done is to start planting the rock garden, and you will find it a good plan to begin this even before the making of the garden is finished. For when you want a plant to grow between two pieces of rock, it is often better to plant it before you place the second piece of rock in position. This is especially the case with plants that have long roots that go deep into the earth, as so many rock plants possess. You must be careful to see that such plants have plenty of earth for their roots, and you must plant these roots deeply, and press the soil firmly all round the plant before you put in the second piece of rock. You will soon discover in gardening that earth has a way of settling down after a time, so that if your plants have not plenty of earth around them at the start, presently some of the roots may become exposed to the air, and if a dry season comes the plant may die because its roots are unable to draw up moisture from the earth. You must be careful, too, that a piece of stone does not hang over a plant beneath it, so keeping off some of the light and sunshine the plant needs.

A lovely sweet-scented bunch of tall Antirrhinums, or Snapdragons. [*Ryder*

Your garden may face north, south, east or west; its soil may be light and loamy or sandy, or heavier and clayey or chalky, or it may be of a peaty nature. All these things are important when you are deciding what plants to grow in it. For some prefer sunshine, some shade, some like light soils, some heavy; and plants, like people, always flourish best under the most suitable conditions. Do not plant your rock garden when the earth is very wet and quickly hangs together in lumps. Wait until it is fairly dry, and the soil is easy to work.

The cheery Cornflower is grown easily in any garden soil. There are blue, red and white varieties of this flower. [*Ryder*

And now for the plants. There are numbers that will grow in a rock garden. First there are the creeping kinds—arabis, aubretia, alyssum, candytuft, and the saxifrages, of which there are several kinds, are some of these, and they will very quickly creep over the stones, forming a beautiful carpet. But you will have to keep them in check, and see that they do not spread too freely and smother other and weaker plants.

DO YOU KNOW WHAT IS THE BEST MOTTO FOR A GARDENER?

Most Alpine plants love plenty of sun. The stone-crops, of which there are many kinds, should be placed in hot, dry places. So should rock roses, and the members of the pink or dienthus family. Thrifts love dry spots. You will see how they flourish in the sand by the sea. You might try to get a little sand for them to grow in in your rock garden. Veronicas, or dwarf speedwells, are other rock garden plants.

Primroses love plenty of moisture and do not need too much sun. Campanulas like moist, cool places, too. Hepatica, American cowslips, anemones, cyclamens, epimediums and primulas are plants that all like the shade. You can plant in your rock garden from autumn to spring on fine, dry days. Give your plants plenty of room, and do not be disappointed if you have only small patches of blossoms the first year. Be patient. Next year you will have large clumps and masses. "I look forward" is a good motto for a gardener. If you put rings of wood chippings round your Alpine plants it will prevent the moisture in the ground from evaporating too quickly. With care and patience you will soon find your rock garden a wonderful spot.

WHEN APRIL ARRIVES THERE IS GREAT ACTIVITY IN THE GARDEN.

When spring comes, about the middle of April, you must start planting seeds in the other parts of your garden. Flowers that will bloom the same year that you sow them are called annuals. Poppies, nasturtiums, larkspurs, mignonette, love-in-a-mist, stocks, sweet peas are some of these. You will be able to buy them all and many others in penny and twopenny packets, and on the packets you will find directions for sowing them.

The golden rule for the sowing of all seeds is —sow *thinly*. You must first, of course, break up your ground very finely with a hoe and then remove all the lumps of earth that are left, and the stones, with a rake, before you put in the seeds, and lightly cover them over with

The Shirley Poppy is a general favourite. It is easy to cultivate and makes a fine splash of colour. [*Ryder* earth. However thinly you sow them you will find that later on, when the little seedlings come up, you will still have to pull up many of these in order that those left in the ground may have plenty of space in which to grow.

HOW TO KEEP YOUR GARDEN WELL WATERED DURING THE SUMMER.

You can sow some seeds in lines, others in circles to come up as patches. Sweet peas must be sown singly, in a *deep* trench, and well covered over. Never sow seeds when the earth is very wet and sticky, nor when it is very dry and powdery, and do not forget to water your seed beds with a can with a fine rose after you have sown them. All through the spring and summer, when the weather is dry, you must keep your garden well watered. Rain water is much better for plants than that from a tap, for it contains certain things that help them to grow. So you should keep a tub nearby, if possible, to collect the rain and store it up for dry days for your garden. In watering sweet peas you should water them *very* well one day, and then leave them a day or two. If you only give them a little water at a time their very long roots will have to come upwards to find it, and that will weaken the plants. The water should sink deep down to them. Be careful not to *drown* your plants with water, and, if you have to use tap water, it is an excellent plan to fill your cans and buckets first thing in the morning, and leave them exposed to the air and sun during the day. This will make the water softer, and its temperature more like that of the atmosphere out of doors. Of course you will never think of watering your plants when the full glare of the sun is upon them !

This sweet-scented Stock is of the type that flowers ten weeks after it is planted: and has gained the name of the ten-week Stock. [*Ryder*

Hardy Carnations are found in many different shades and are divided into classes according to their colouring. [*Ryder*

WHEN IS THE BEST TIME TO WATER THE GARDEN ?

This is bad for them in several ways. The best time for watering during the summer is the evening, when the sun is not so powerful, and the water will be able to sink down to the roots during the night, without fear of its being evaporated by the heat before it gets there. For you must remember that it is the roots of the plants that need the water, not their leaves and blossoms, although you may occasionally give these a shower to freshen them up in the cool of the evening when the weather is very hot and dry. But it is most important that you should give your plants *enough* water to sink down to their roots. A mere sprinkle on dry ground does more harm than good, for it tempts the roots to come upwards for the water, and that is bad for them. When the ground is hard and dry

The Sweet Pea is one of the loveliest of our garden flowers, and can be grown in many delicate and beautiful shades. [*Ryder*

you should break it up, every now and again, with a hoe, or a small fork, if the latter does not damage the roots of the plants. This loosens the soil and lets the air in, and the water can then sink down more easily. Some plants need more water than others. Roses and ferns need a great deal, so do phloxes, pansies, musk and hollyhocks, whereas geraniums, snapdragons and rock roses prefer to be fairly dry.

SOME USEFUL HINTS ON HOW TO KEEP YOUR GARDEN IN GOOD ORDER.

You must keep your garden well weeded if you wish your other plants to flourish, and the best way to do this is to pull up a weed directly it appears. Weeds take up nourishment required by your flowering plants, and they grow apace and will quickly overrun a garden if they are not kept well in check.

When your sweet peas are a few inches high they will require "sticking." If you cannot get proper pea sticks you must use plain sticks with string wound from one to another in several rows up which the peas can climb.

Another task for summer is to watch for green fly upon the leaves and buds of your rose trees, and to remove them at once before they do any damage. You can do this quite easily with your fingers.

As the summer advances some of your flowers will die, and seeds will take their place. This weakens the plants and prevents their producing more blossoms. So you should snip off every day all faded or dead blossoms, unless you particularly wish a plant to produce seeds.

EVERY MONTH THERE IS SOME NEW JOY TO BE FOUND IN THE GARDEN.

In June you should sow some wallflower seeds so that the plants may blossom next spring; in August, pansy seed and blue cornflowers. Indeed, almost every month during the spring, summer and early autumn there are some seeds to be sown. When your perennial plants have finished blossoming in the autumn, all the dead parts should be cut down and merely the roots left in the ground. When the annuals have finished blooming they must be pulled or dug up and thrown away.

These are but a few of the many things to be done and the plants to be grown in that most wonderful of all things to possess—a garden. The others you must find out for yourselves from older and more experienced gardeners (who are generally quite willing to tell you things if you are keen to learn), or from gardening books.

Miniature Sunflowers open wide to catch every ray of sunshine. They add a decorative touch of brightness and gaiety to the garden. [*Ryder*

Liverpool Cathedral, our most modern example of church architecture, is a building of great beauty and grace.

GOD'S GLORY IN STONE

The first real attempt to set up buildings that would stand for centuries was made in the building of houses of worship. So it is that our oldest and loveliest structures are churches, monasteries, abbeys and such abodes of religious activities. The Saxons began to build soon after they learnt of Christianity. The Normans, better builders, made solid structures that have defied the ravages of time and weather. Later the religious buildings became more elaborate, as you will learn below. Pillars were more slender; windows, arches and doors more decorated; and so we have distinct " periods " whereby we judge the age of an old church. This section will teach you how to find out for yourself the age of a religious building. The study of such old places is very fascinating, and if you also take photographs you will soon find yourself making a hobby of it.

BEFORE the Saxons came to England, that is, before A.D. 450, there were few churches in Britain, although the Romans built one or two, like the early building at St. Martin's, Canterbury. There were relics of heathen worship in temples such as Stonehenge, which was really a " church " open to the sky and surrounded by a graveyard.

But our earliest considerable remains of God's glory in stone are seen in the churches built in Saxon times, that is from about A.D. 450 to 1066. These churches, and those of the Norman period which follows, are said to belong to a style known as Romanesque, because they are similar in some ways to the churches of the Roman Empire with their round arches distinguishing them from Greek and Egyptian buildings of earlier days. Romanesque churches, although like Roman buildings, are not simply imitations. The Saxons and Normans adapted Roman ideas for their own particular purposes.

There are many marks which enable us to recognise Saxon churches. In plan they were often oblong like the law courts of the Romans. Sometimes arms would be added, making the church like a cross. Doors, windows and arches had semi-circular or triangular heads. Often the windows had a rough kind of baluster like a table leg. The usual material for the walls was small stones, irregular in shape and size. Even when a liberal amount of mortar was used, there was danger of the walls crumbling, especially at the edges. Thus larger stones were placed at the corners, alternately horizontally and vertically, giving the well-known long and short work. To strengthen the walls still more, horizontal bands of larger stones were placed in the building, which thus became divided into storeys. These wall spaces were again divided, this time by vertical bands of larger stones—pilasters they were called—and the result was not only the strengthening but also the beautifying of the wall.

The Normans also took ideas from the Roman style of architecture, and their churches closely resemble those of Saxon days.

Kirkhammerton, near York, has an ancient church with a fine Saxon tower shown above. [*Photo: John R. Crossland*

In the twelfth century the Normans in England were building churches with thick walls and massive pillars. They were dignified and generally simple in plan, although at times much care was lavished on decoration. Windows and arches still have rounded heads, but they are now frequently ornamented with various devices from zigzag or chevron work to a fanciful resemblance to birds' heads known as beak-head work. Attempts were made in this period to roof churches with stone, and thus the great weight of the roofs made strong pillars and thick walls a necessity, and frequently buttresses were required to support the latter. It is due to the fact that these churches were strongly built that England still possesses so many Norman churches.

It is thus quite easy to distinguish between the buildings which the Saxons developed from Roman structures and those which the Normans produced. But in both what we get is really a simple church composed of two parts, the chancel for the clergy and the nave or main body of the church for the congregation.

THE EARLY ENGLISH PERIOD BRINGS GRACE AND BEAUTY TO ARCHITECTURE.

With the coming of the thirteenth century, the style of architecture in England changes very considerably, and we get what is known as the Gothic type. The causes for this change were the practical difficulties concerning the stone roofing—vaulting it is called—of the churches. For three centuries Gothic work continued to enrich the new buildings.

In the first of these churches were constructed in what is known as the Early English style. Now, the whole building appears lighter. Everything in the church seems to point upwards and the effect is more pleasing than that of earlier churches. This is very evident in the spires which are so noted in this period. It might be thought that these are of little use beyond being ornaments. At first, however, they were just light roofs to the towers, to throw off snow and rain. In time they were lengthened, and as this helped to beautify the building the process was carried on until we reach the glory of Salisbury Cathedral spire, which is 404 feet in height.

Clever architects discovered the secret of constructing a stone roof which did not need heavy walls, but merely buttresses supporting the walls in certain places.

Windows in these churches are long with sharply-pointed heads, and are known as lancets. All the carving is executed with the greatest of care, being deeply cut. This was effective in our dull northern climate as it produced the necessary contrasts of light and shade. The tops of pillars are woven into masses of stiff-leaved upright foliage, while many of the clustered shafts of the pillars are enriched with carving known as dog-tooth work. This decoration is developed from the Norman nail-head work, which is really a succession of small pyramids in stone. These are now beautified by being cut into four-leaved flowers somewhat resembling a dog's back teeth.

THE "FIVE SISTERS" OF YORK—AND THE "DECORATED" PERIOD.

Lancets were often grouped together, with the result that churches were much lighter than of old. Beautiful stained glass makes its appearance, and one has only to see a cluster of lancets like the Five Sisters' window in York Minster to realise what loving care was lavished on the churches of this period. They were God's glory in stone, but they were man's glory too.

The second type of Gothic architecture in England is seen in the fourteenth century and is merely a development of the early English work. The name Decorated work indicates what is to be expected with regard to it. More and more attention was paid to decoration, which grew to be something apart from the building itself. Instead of the builder being allowed to decorate his building as he thought fit, he was ordered to put up a structure which should provide for a considerable amount of decoration. Niches had to be constructed for the carver's work, heads of pillars were lavishly decorated with carved wreaths, while arches, windows, doors and even buttresses were carved with ball flowers or four-petalled flowers. The very hollows of the mouldings were often decorated with these carvings. But a closer inspection shows that the work was not quite so carefully executed as in the last century. Mouldings were not so deeply cut, but we cannot say there is much decline when such treasures as the Percy Tomb in Beverley Minster are executed.

Windows in this period do not differ very much from those of the previous period. Three or four lancets were grouped together and a hood moulding put over the cluster to prevent rain running down on to the windows. The space between the top of the lancets and the moulding was filled with windows of a geometric or a more flowing pattern.

THE PERPENDICULAR STYLE BRINGS TO OUR BUILDINGS A SLENDER GRACE.

A third type of Gothic architecture is seen in England in the fifteenth century. This is known as Perpendicular work, where perpendicular lines are much in evidence, especially in the windows. These latter are wider and have flatter heads, the space between the lancet tops and the moulding being filled with windows, or lights as they are called, which have many perpendicular lines.

The roofs in these churches are very magnificent. Built of wood or stone they are divided into panels and enriched with mouldings and carvings. It would be impossible to find a more magnificent roof than that of King's College Chapel, Cambridge, where the stone roof spreads out its tracery in fan-like formation with pendants of stone hanging in wonderful fashion here and there.

Westminster Cathedral, the seat of the Roman Catholic archbishop, is a red brick building in the Byzantine style. The campanile or tower is 283 feet high. Begun in 1895, the church was consecrated in 1910. The interior is beautiful and the walls are lavishly decorated with mosaic work.

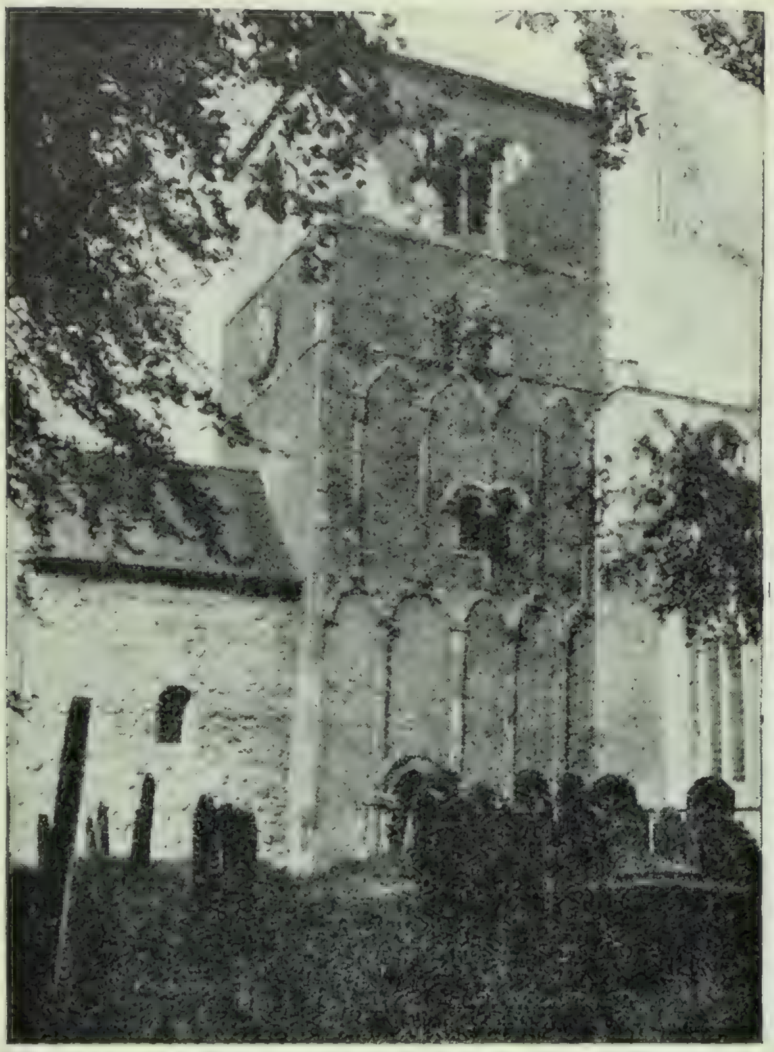
Truro Cathedral, here seen towering above the Cornish town of that name, is a nineteenth century church built in the Early English or Gothic style of architecture.

It was during this period that we got some of our most glorious towers. Go to Boston, Manchester and Newcastle, to mention a few only of our cherished towers, and you will begin to realise what is meant by "God's Glory in Stone."

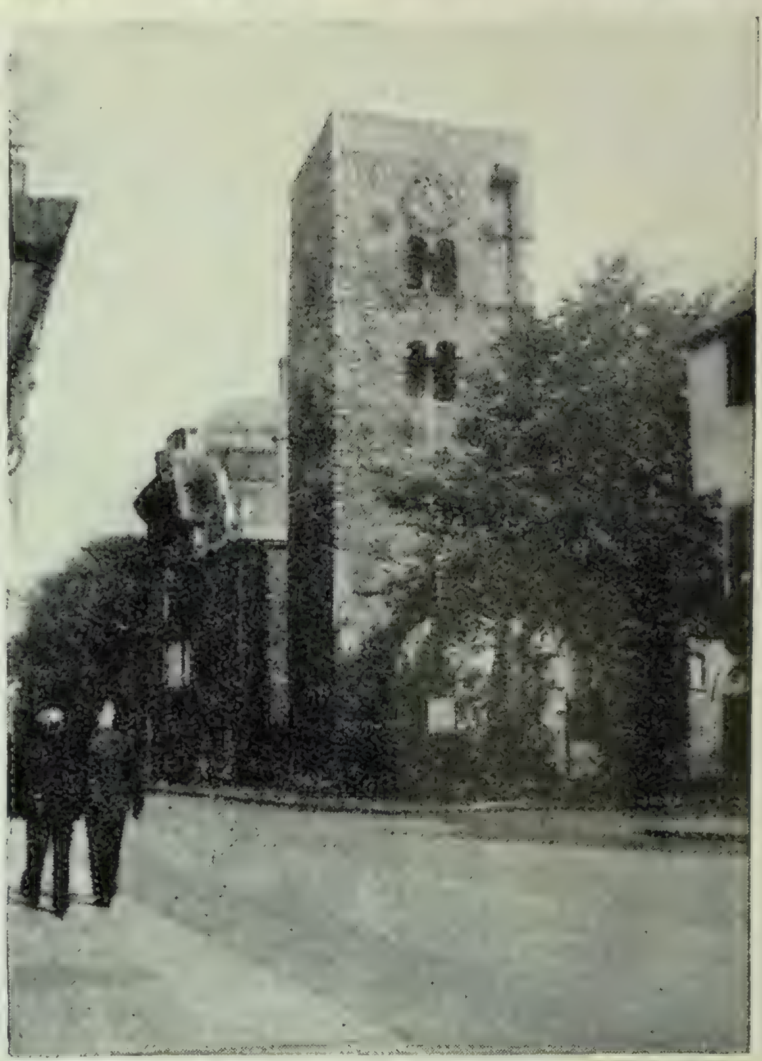
THERE IS BEAUTY AND INTRICATE WORKMANSHIP IN THE ORNAMENT.

Within the church your eye is arrested immediately by the woodwork, the screens and pews presenting the same rich appearance that is found in the stone work. Ornament is everywhere seen and the stamp of this really English work is the Tudor rose, which is never far to seek in a Perpendicular building.

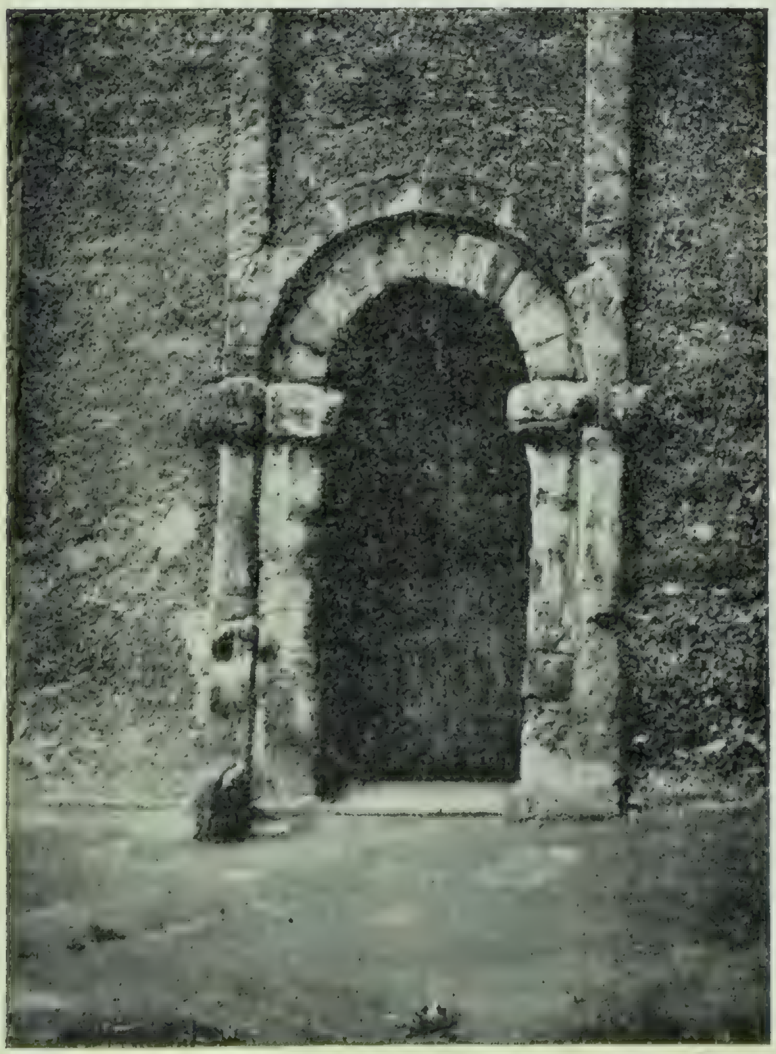
OUR SAXON FATHERS LEFT US THESE

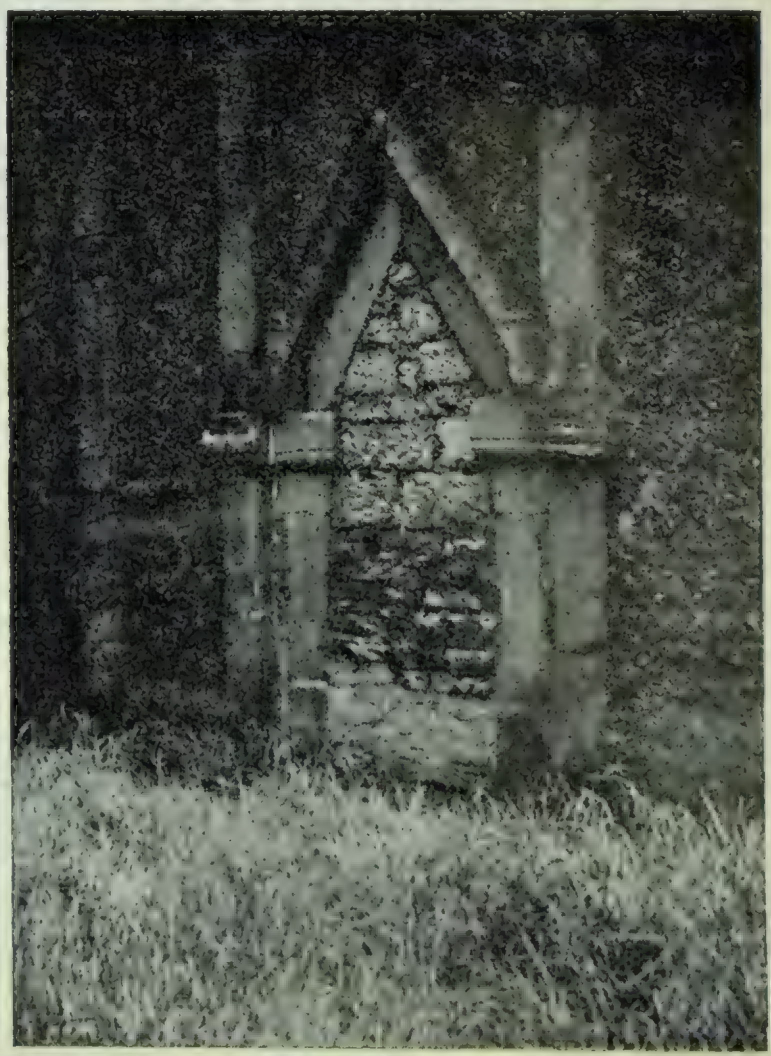


The beautiful Saxon tower of the church at Barton-on-Humber has stately arcading work.



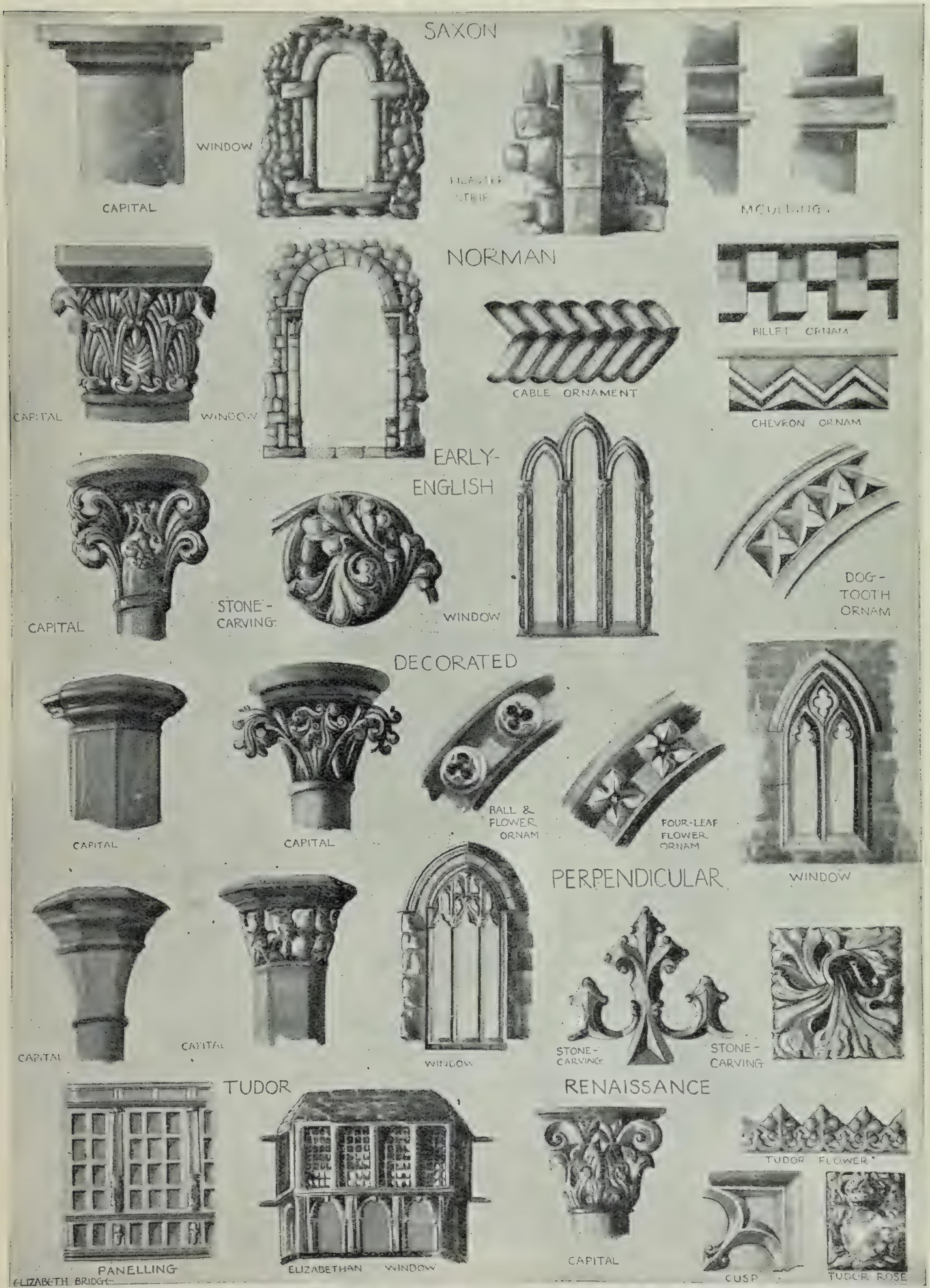
The Church of St. Michael's, Oxford, has a fine old Saxon tower which is still standing to-day.





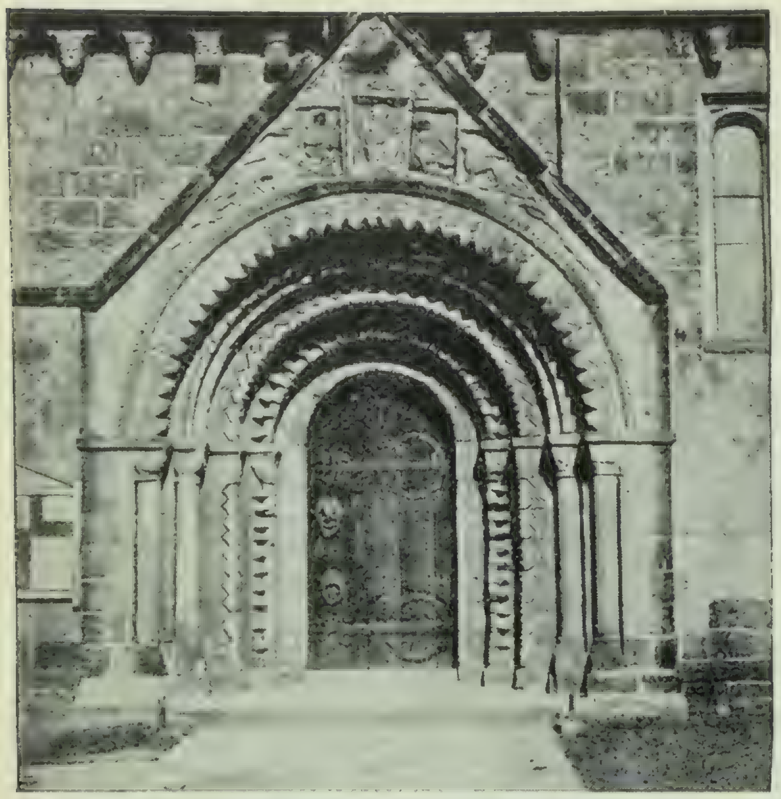
The two photographs above are of doorways in the Saxon church of Barton-on-Humber, the tower of which is seen on this page. Note the difference in style of the arches. *[Photos : C. E. Wright, M.A.*

CAN YOU TELL THE AGE OF AN OLD CHURCH?

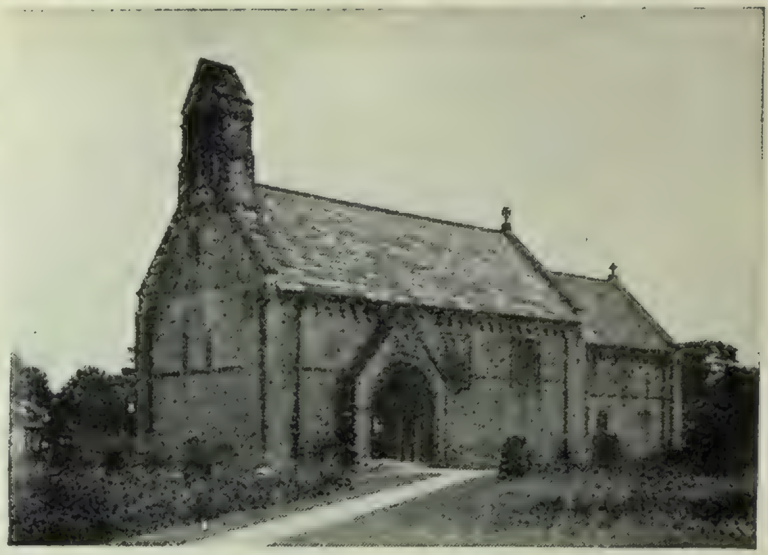

SAXON
CAPITAL
WINDOW
PILASTER STRIP
MOULDING
NORMAN
CAPITAL
WINDOW
CABLE ORNAMENT
BILLET ORNAM
CHEVRON ORNAM
EARLY-ENGLISH
CAPITAL
STONE-CARVING
WINDOW
DOG-TOOTH ORNAM
DECORATED
CAPITAL
CAPITAL
BALL & FLOWER ORNAM
FOUR-LEAF FLOWER ORNAM
WINDOW
PERPENDICULAR
CAPITAL
CAPITAL
WINDOW
STONE-CARVING
STONE-CARVING
TUDOR
PANELLING
ELIZABETHAN WINDOW
RENAISSANCE
CAPITAL
TUDOR FLOWER
CUSP
TUDOR ROSE
ELIZABETH BRIDGE

The above drawings show you some of the chief characteristics of the various periods of English architecture. The design of the windows, pillars and mouldings of an old church will tell you the period in which the church was built.

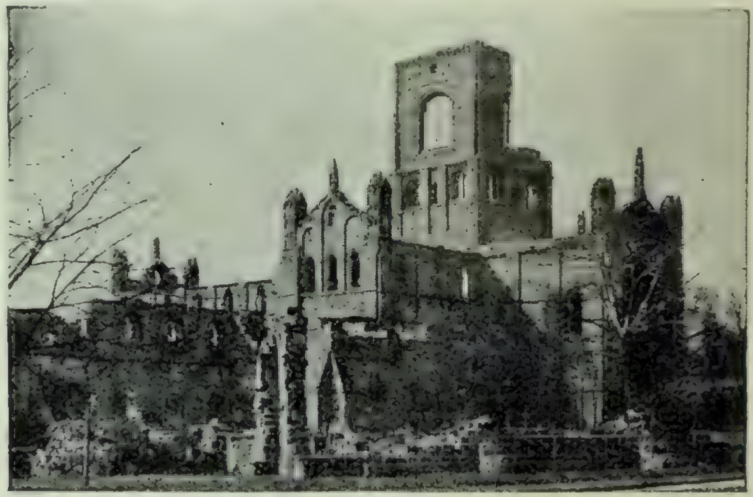
NORMAN STRENGTH AND SIMPLE GRACE



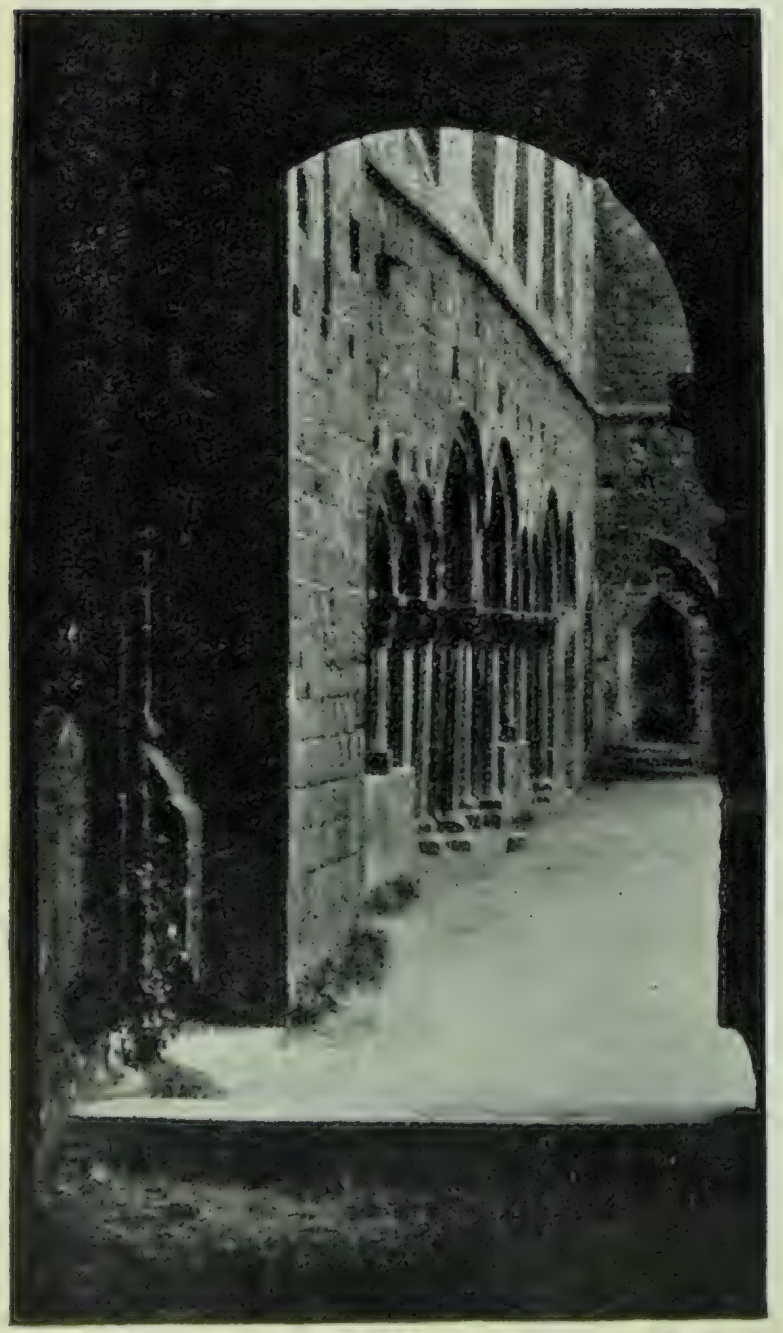
The beautiful Norman doorway of Adel Church. Note the carvings on the round arches. [*C. E. Wright*



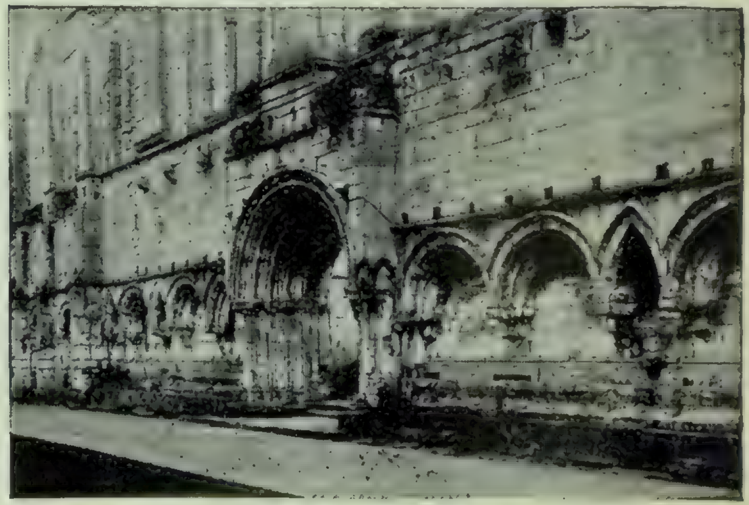
The Norman Church at Adel, near Leeds. [*C. Hopkinson*



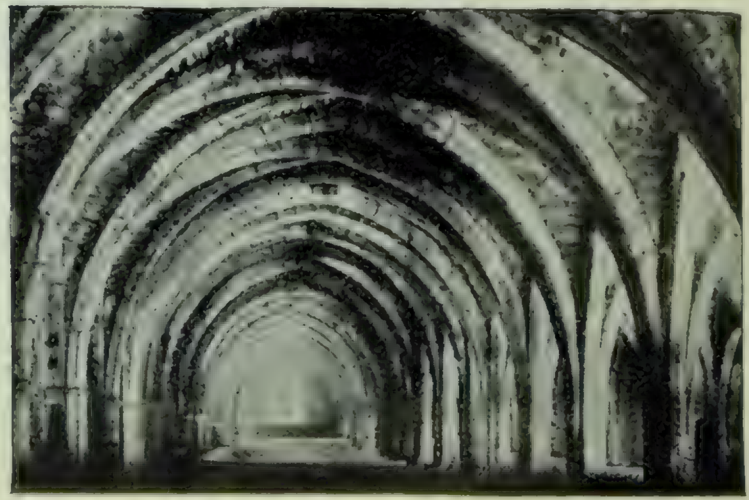
Kirkstall Abbey, a Norman ruin near Leeds. [*C. E. Wright*



The East Cloister, Kirkstall Abbey, Leeds. [*C. E. Wright*

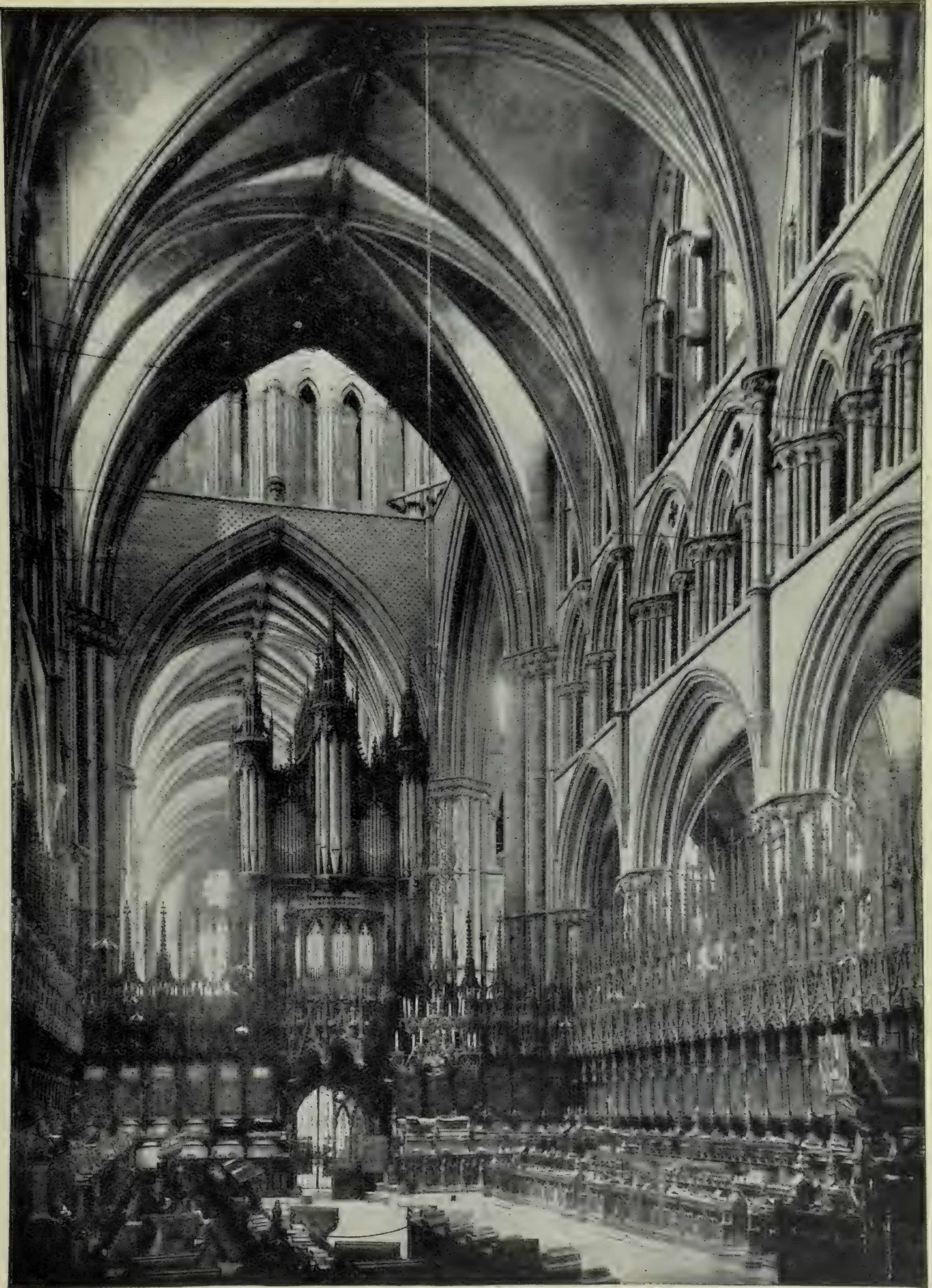


The South Cloisters at Fountains Abbey. [*C. E. Wright*



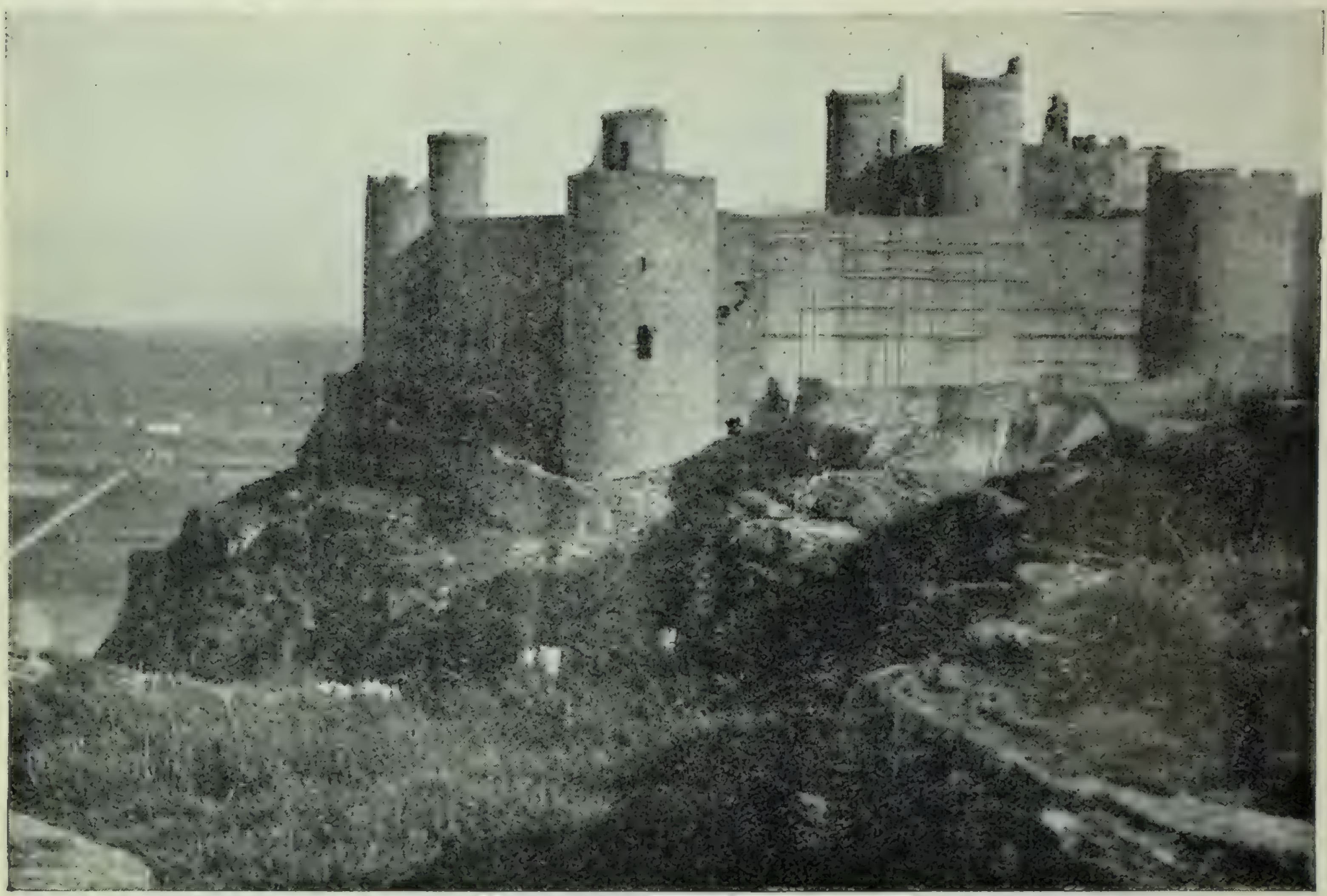
Arches of the Cellars, Fountains Abbey. [*C. E. Wright*

LINCOLN'S GLORIOUS HOUSE OF HOLY FAME

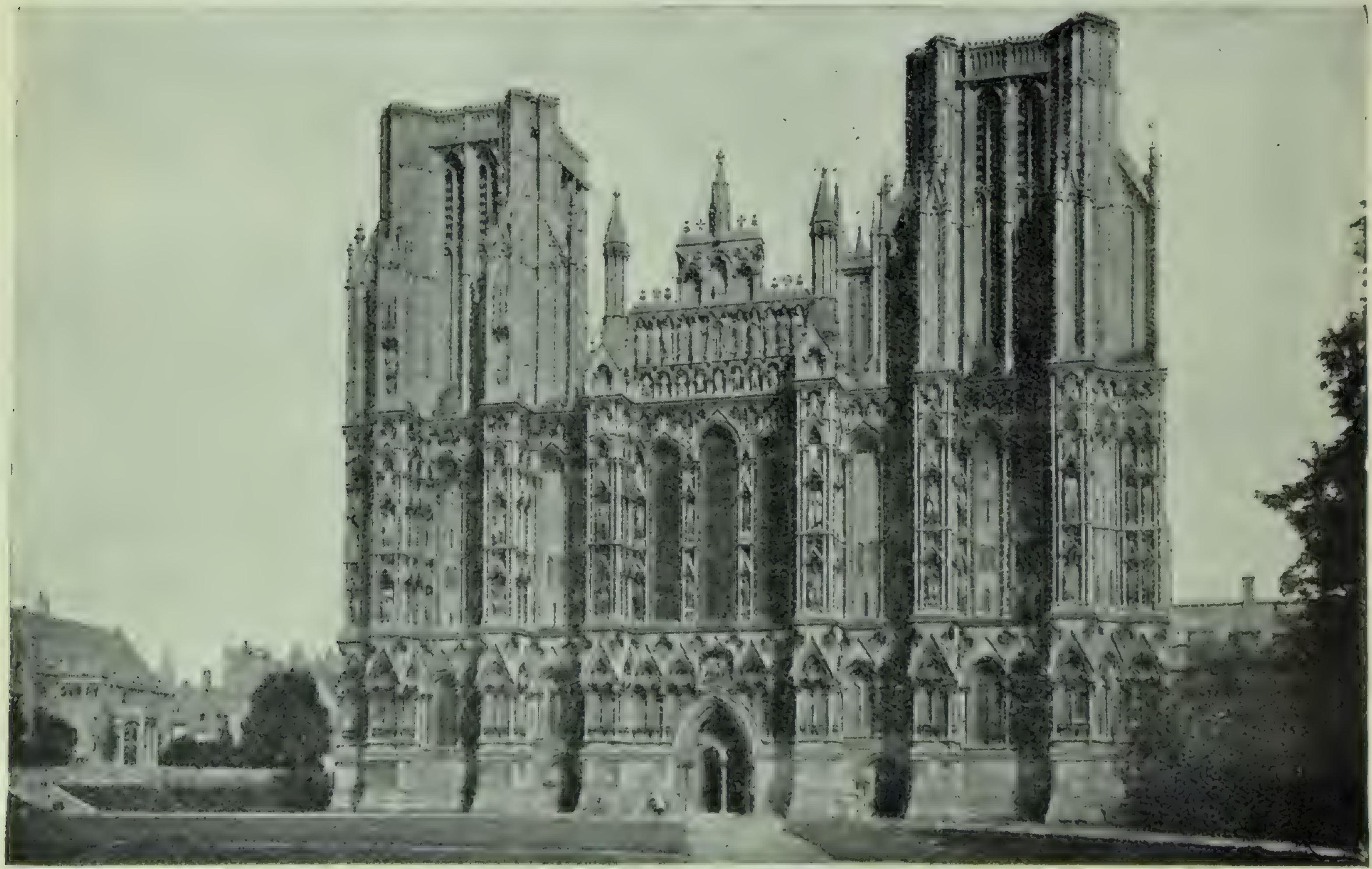


The magnificent Choir of Lincoln Cathedral is the work of Geoffrey Noyers. He built this beautiful work in the twelfth century. It was in process of building in the time of Bishop Hugh of Lincoln, as you have read on page 224.

TWO NOBLE RELICS OF A MIGHTY PAST

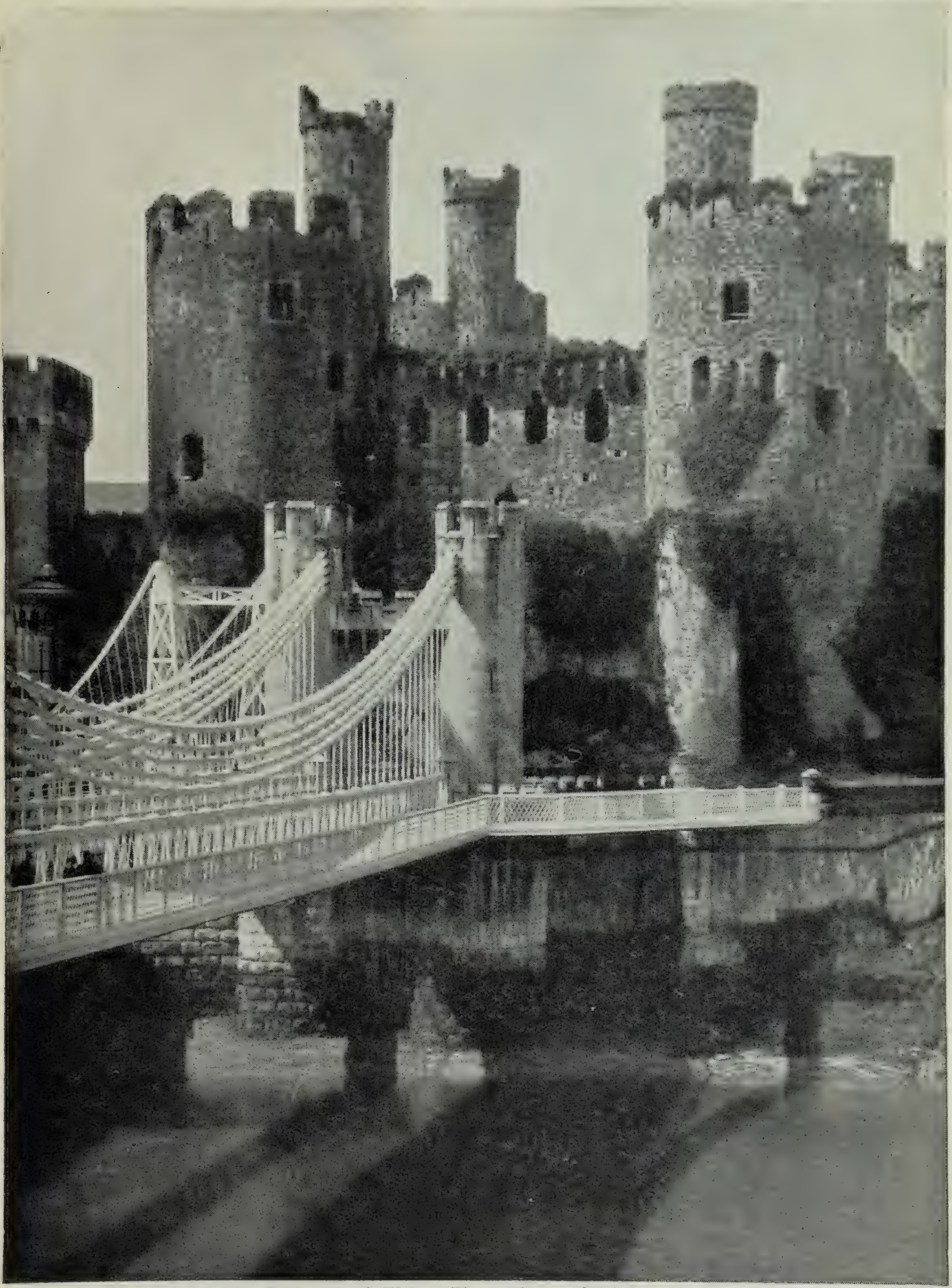


Harlech Castle, standing on an eminence in Merionethshire, Wales, is a noble ruin of an Edwardian " concentric " castle—one with circles of fortifications, the inner ones being higher than the outer. It was built in the thirteenth century.

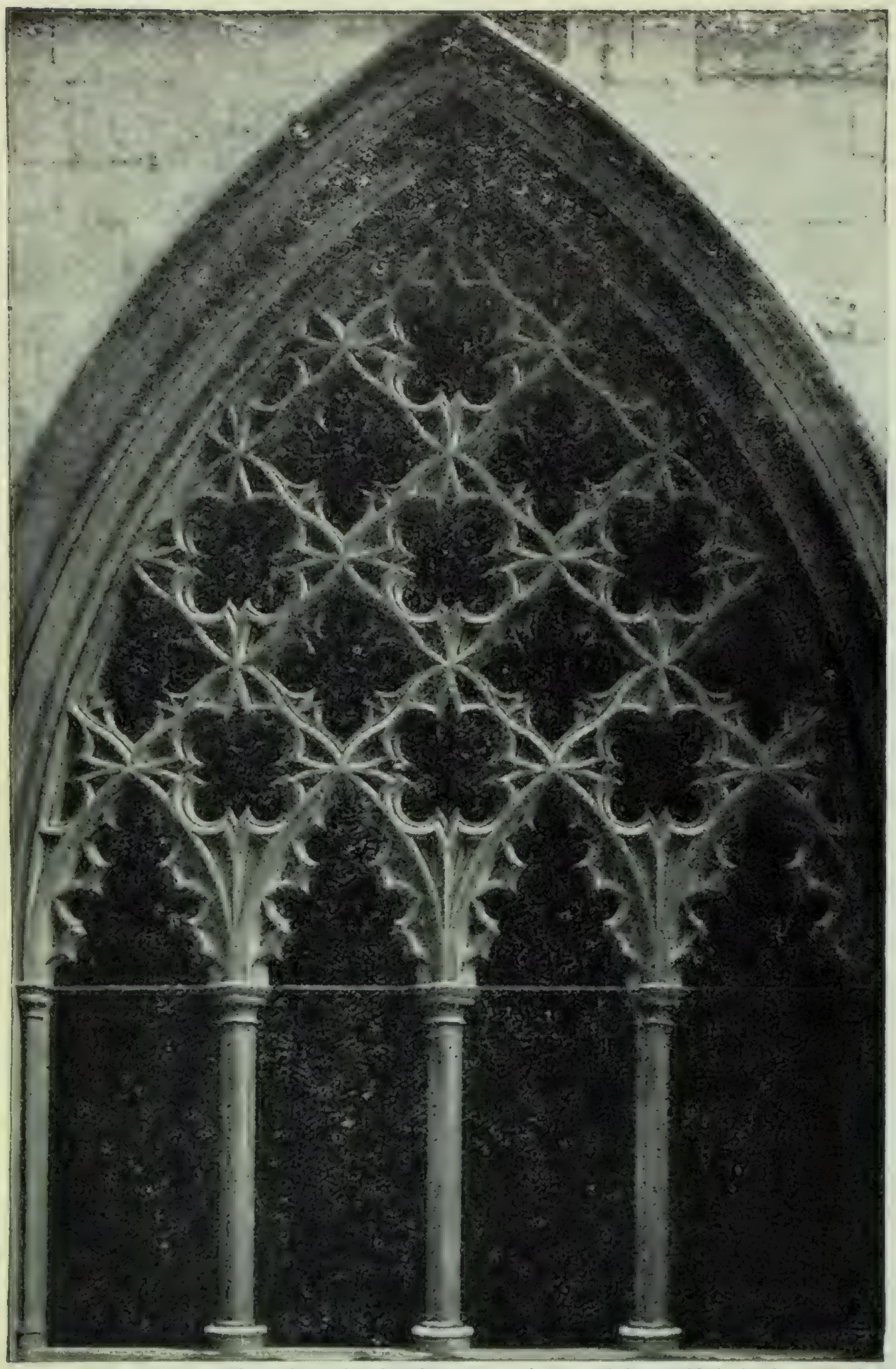


Beautiful Wells Cathedral, in Somerset, was built in the twelfth and thirteenth centuries by three English Bishops. The west front, seen above, is decorated with between 300 and 400 sculptured figures. The two western towers were never completed. The central tower is 160 feet high, and the whole length of the Cathedral is just over 380 feet.

A GEM OF ANCIENT WALES—CONWAY CASTLE



Conway Castle and Suspension Bridge, North Wales. The castle was finished in 1284 for King Edward I., and has walls over 15 feet thick. During the Civil War of Charles I.'s reign, the Royalists held it for three months, and then it was taken by the Parliamentary army. The Suspension Bridge was completed in 1826, and is made with round towers so as not to spoil the beauty of the castle behind. From the castle towers a wonderful view is obtainable. [*Will F. Taylor*



It is difficult to realise that the intricate carving and beautiful design of the delicate tracery of this window are executed in stone. This "Decorated" window is one of those in the cloisters of Westminster Abbey. [*Mansell*

Throughout the Gothic period changes have been going on to accommodate a growing population. The churches were often enlarged by adding portions to the nave, thus producing aisles. Chapels were added to various parts of the buildings. The addition of porches shows how church builders had continually to be thinking of the ravages made by the weather in northern climes. The beautiful carvings on our doors must be preserved even at the expense of hiding them.

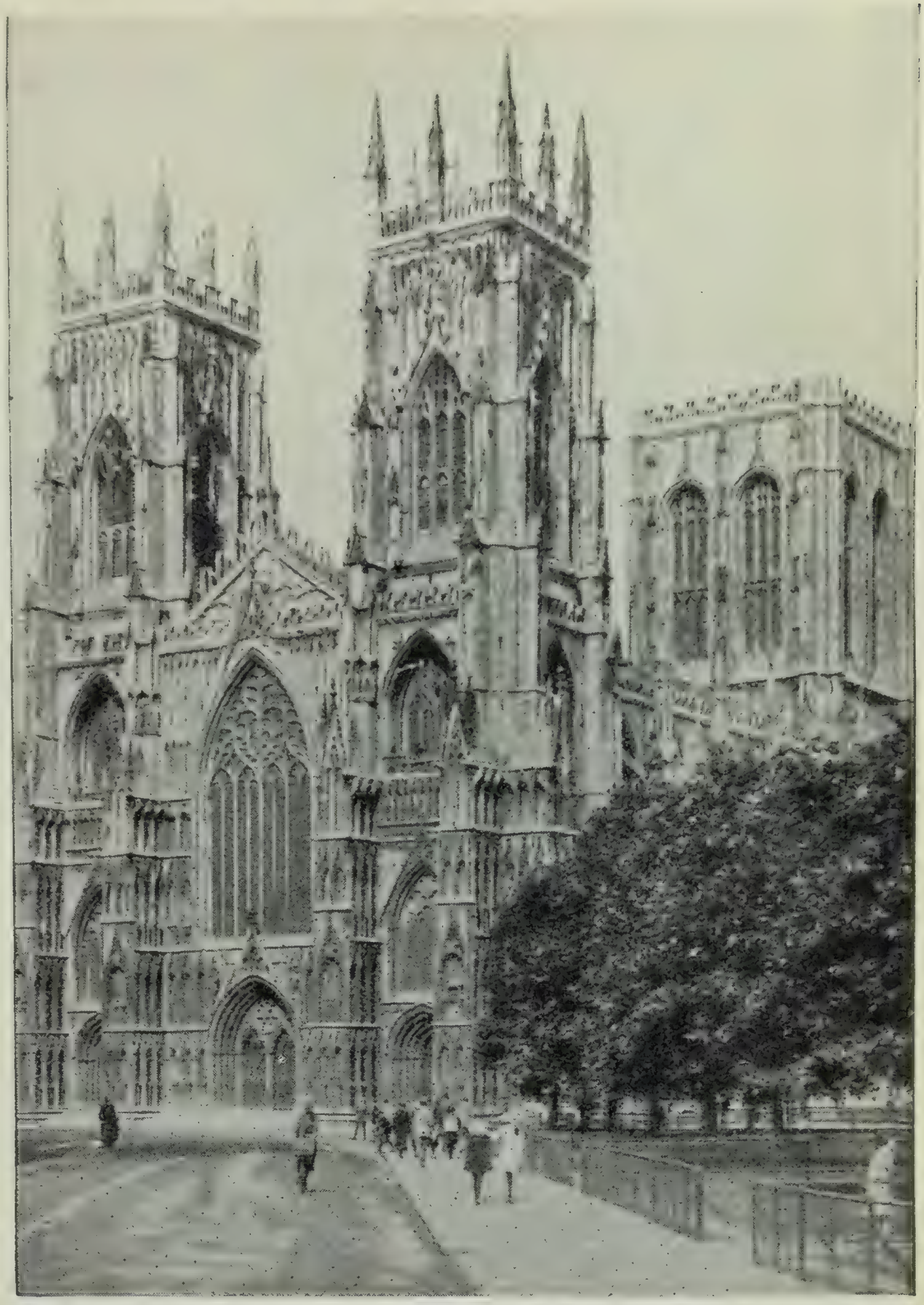
From the sixteenth century many changes are taking place in the style of architecture found in churches. Gothic architecture begins to lose its chief distinguishing characteristic, the upright line. Some people mark off another period of architecture which they style Tudor from the monarchs who were then reigning. But this type is really very similar to the Perpendicular.

In this period there were, however, new ideas which, coming from abroad, especially from Italy, bring about a new style known as Renaissance. The word itself means re-birth. It is the re-birth of old ideas in architecture, where the horizontal line begins to replace the vertical line so prominent in Gothic structures.

THE GENIUS WHO REBUILT LONDON AFTER THE FIRE.

The first able architect who took up these new ideas was Inigo Jones, the surveyor-general of buildings for James I. But a greater name still is that of Sir Christopher Wren. He despised the Gothic style of architecture and used the term Gothic to express his contempt for it, for the Goths used to be regarded as outlandish people. What was considered a great calamity, the Great Fire of London, in 1666, gave Wren his chance, for in the re-building of the city he could introduce his new ideas quite freely. He was entrusted with the construction of many churches and, most important of all, St. Paul's Cathedral. In this building we see a great resemblance to the Cathedral of St. Peter in Rome, with its dome and many columns. The churches put up by Wren in the City of London are generally noted for their spires. The architect could not show off his building to very great advantage with surrounding buildings hemming it in, and so he concentrated on those interesting spires which are so conspicuous in all parts of London. The spire, at any rate, would be seen and consequently it was made as striking as possible. Wren showed much originality in his spires.

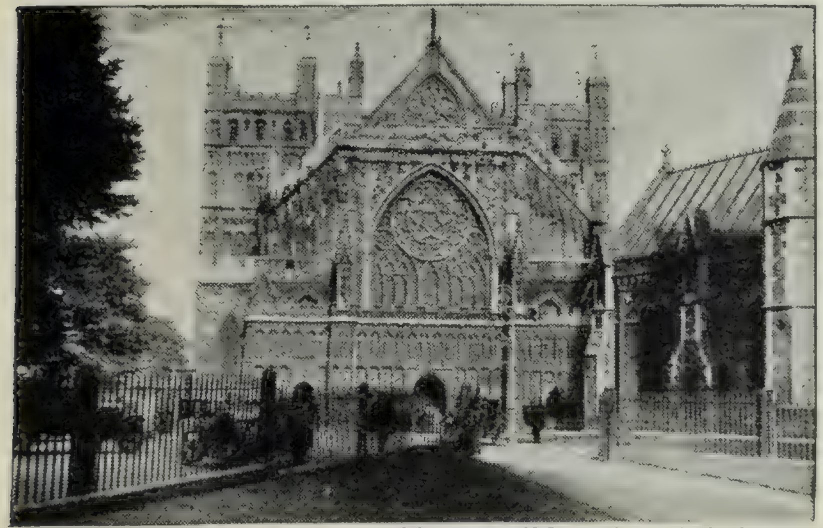
In the nineteenth century many people turned back with great enthusiasm to things of the Middle Ages, that is from about A.D. 300 to A.D. 1500. Amongst other subjects of interest, architecture received its share of attention ; people began to praise the Gothic style and tried to copy it. But this was difficult. The times were altogether different from those of the real Gothic work, and so there was something unreal about these "Gothic" churches erected in the nineteenth century. As long as they were picturesque—and Truro Cathedral, possibly the finest work of the kind, shows how picturesque they could be—little heed was paid to the purpose they were intended to serve. Imitation was carried to the lengths of copying the deeply carved mouldings, but they were often plaster casts where previously there had been stone.



York's majestic Minster has examples of Early English Decorated and Perpendicular architecture. The central tower is nearly 200 feet high. The beauty of the west front with its twin towers is here seen. [*Photochrom*

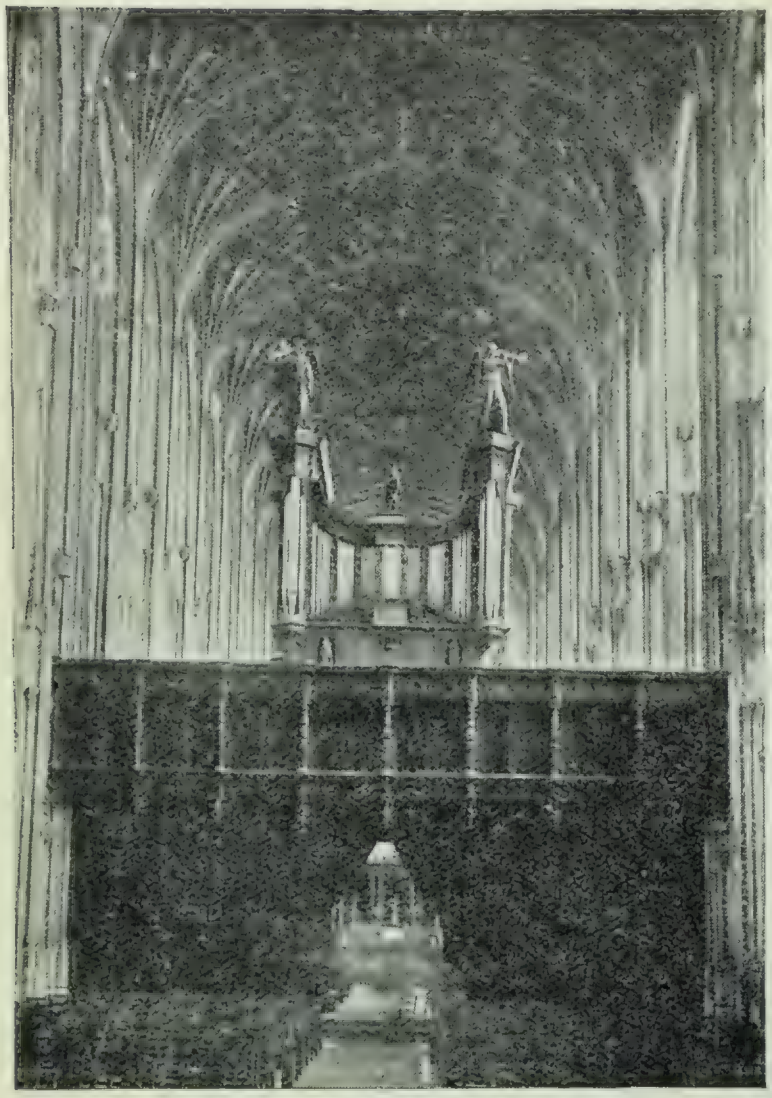
THE PRESENT CENTURY IS AN AGE OF EXPERIMENT.

The present century has thus a big task ahead to lift architecture out of the muddle into which it has sunk. The work is being tackled. Nowadays, people certainly think about the appearance of their buildings, but they do not lose sight of the practical purposes which have to be served. Germany seems to be leading the way, and her influence is spreading to other countries, such as Sweden. The buildings are very striking looked at as a mass of masonry, although it will probably take quite a time to get accustomed to such a building as the church at Stockholm, which resembles a huge organ with its massed upright pipes. But the buildings are, before all things, useful.



Exeter Cathedral is a magnificent edifice though it is not very large. The west front, which we can see in the picture, has a screen bearing many sculptured figures. Note the beautiful tracery in the west window.

In America the problem is sometimes a peculiar one, for lack of space may compel the architect to combine a church with office buildings and so probably the ground floor will serve as the church, while the rest of the building is let off for business purposes. There are not many outstanding features to mark God's glory in stone in this country !



On the roof of King's College Chapel, Cambridge, there is a wonderful example of delicate fan-vaulting.

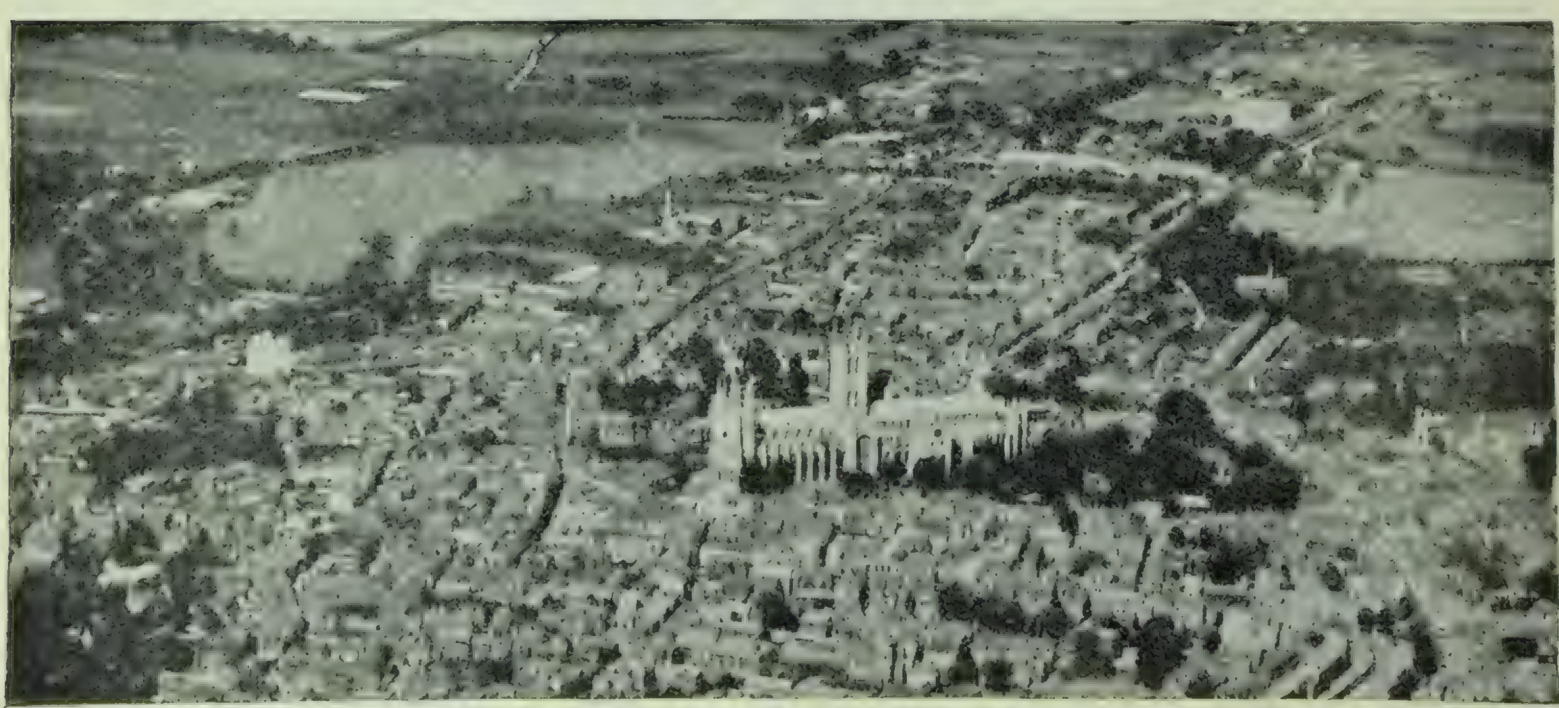
THE WONDER OF LIVERPOOL'S MAJESTIC MODERN CATHEDRAL.

We, in England, are slow to receive new ideas and have not gone quite so far as the Germans. But, still, a new movement is apparent, and you can see it well illustrated in the new cathedral in Liverpool. At first you will say, " Why, that is just like one of the churches of the Gothic period." In some respects you are right, but it is very different from the Gothic of the thirteenth, fourteenth and fifteenth centuries, and from the imitative Gothic of the nineteenth. The architect, a very young man, Sir Giles Gilbert Scott, thought partly of producing a striking and massive building, but he had in mind, also, the needs of the present day when a church must have, above all, a comfortable place for hearing and seeing the service. He has thus designed his work to provide a huge space or auditorium, as architects call it, where there shall be no pillars to obstruct one's vision.

THE LARGEST OF ALL OUR CATHEDRALS IS NOW BEING BUILT.

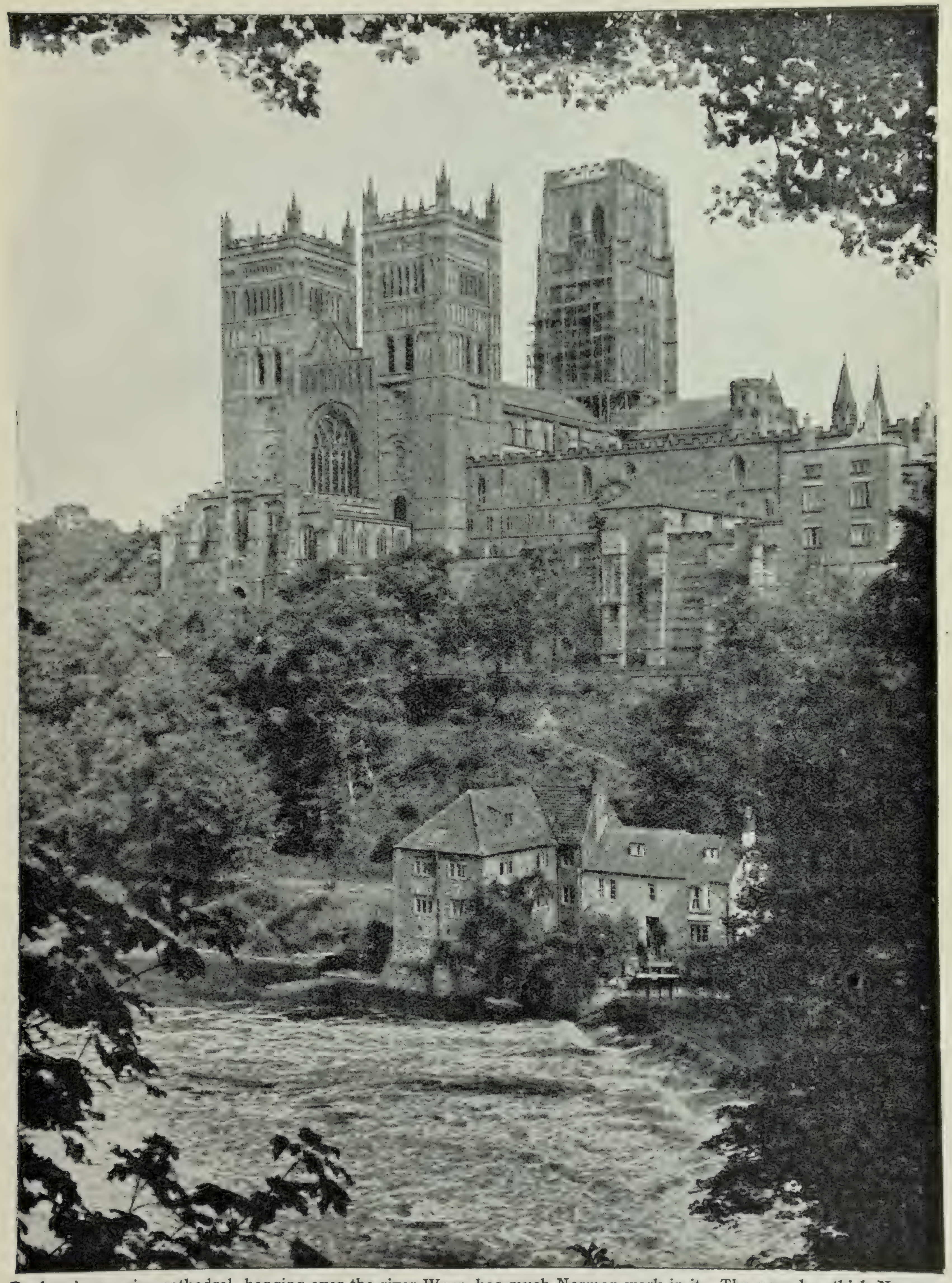
Round this central idea his church has grown, and although he makes changes as the building proceeds—for it will not be completed for many years—yet he clings to the idea of meeting modern needs. Thus we may term the church Gothic, but it would be well to label it Adapted Gothic. It is to be the largest of our cathedrals, for it will be over 600 feet in length, and as we gaze at it, commanding, as it does, the whole of the town, we cannot but feel that man has not forgotten the art of building " God's Glory in Stone."

Below is an air view of Canterbury, where Augustine, in the long ago, built, by permission of King Ethelbert of Kent, his first church. To-day the cathedral dominates the countryside, and all over the country churches stand above the house-tops proclaiming the faith of man and his pride in his stone offerings to God.



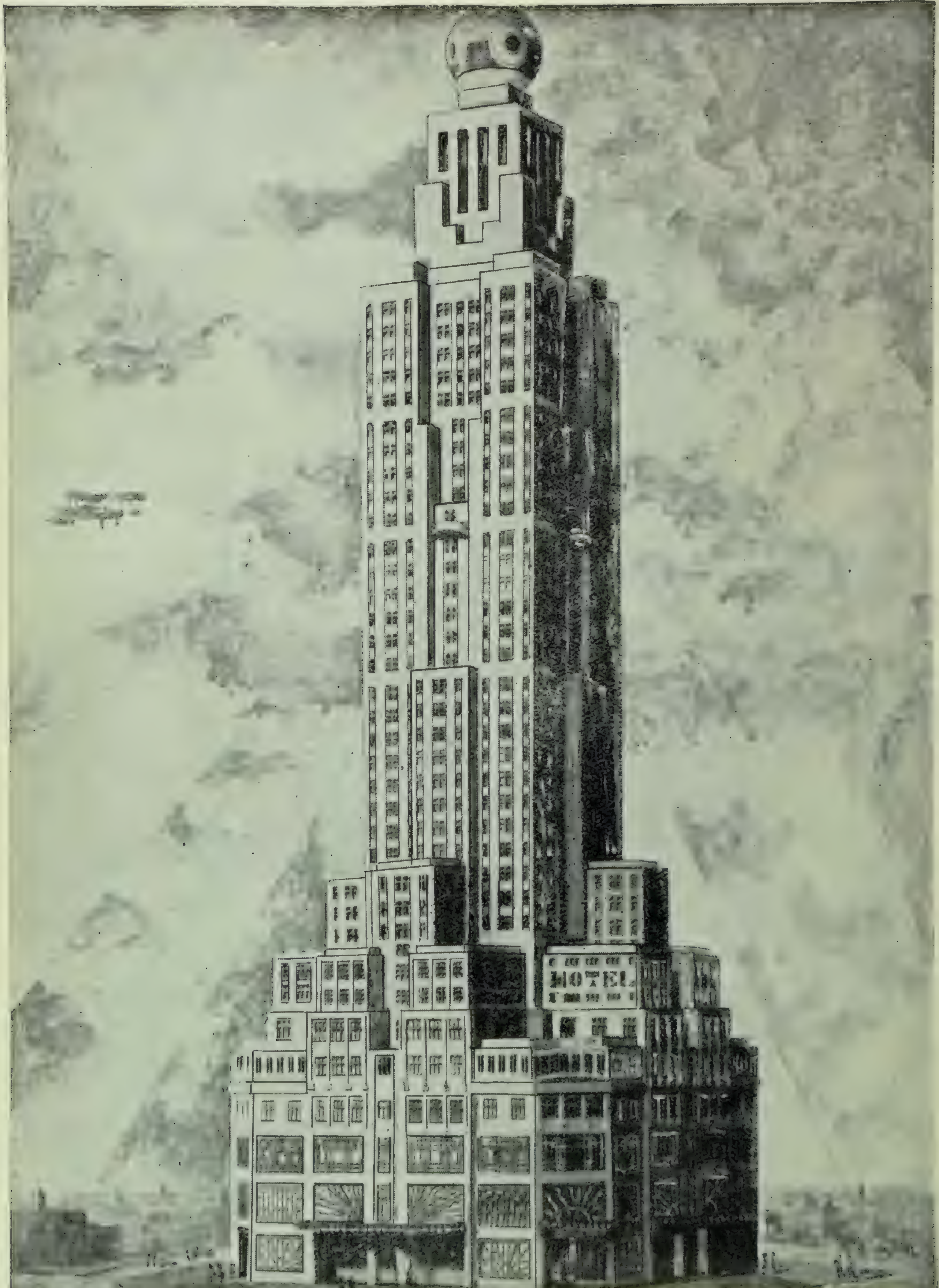
Canterbury Cathedral dominates the countryside, as we can see from this air-photograph. Here, in bygone days, Augustine founded the first English church. Here Thomas Becket was murdered at the altar in Henry II.'s time, and here to-day at this majestic building the Archbishop of Canterbury makes his headquarters. [*Aerofilms*

DURHAM'S MIGHTY MINSTER TOWERS



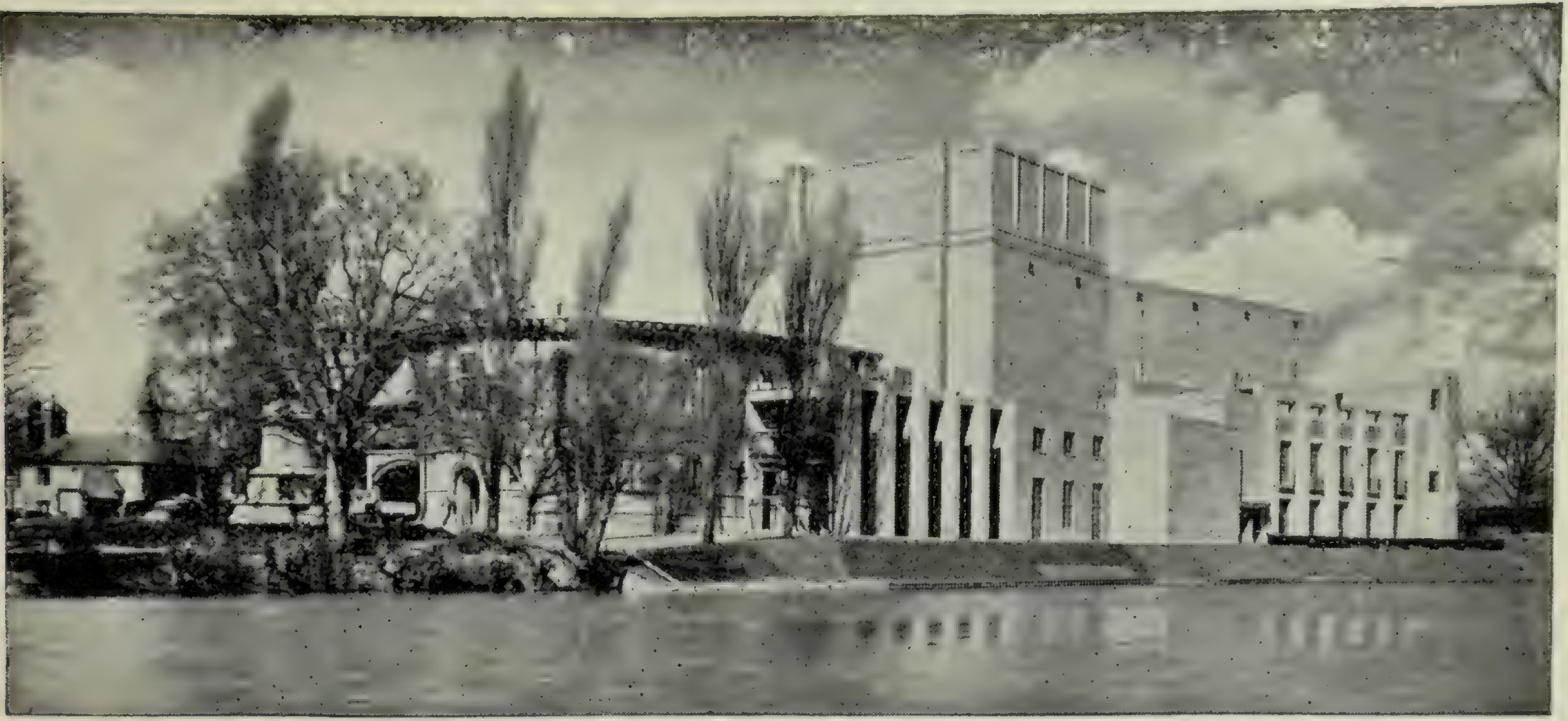
Durham's massive cathedral, hanging over the river Wear, has much Norman work in it. The nave has thick Norman pillars and semi-circular arches. Note the strength of the towers and the narrow windows seen in this beautiful picture. These are peculiarities of Norman building, where solidity came before grace. [*D McLeish*

SHALL WE HAVE A BRITISH SKYSCRAPER?



The architect's drawing for the proposed Sun Ray Hotel at Blackpool is shown above. It becomes more slender as it rises higher, thus allowing the maximum amount of window space and sunlight. The ball at the top is to be lighted to imitate a sun. Heating and ventilation of such a building is a serious problem. *[Courtesy I. Massey, Architect.*

MODERN IDEAS IN ARCHITECTURE



The Shakespeare Memorial Theatre, recently erected at the dramatist's birthplace, Stratford-on-Avon. It was built with funds subscribed by English-speaking people all over the world who wished to honour Shakespeare's memory, and was opened by H.R.H. The Prince of Wales, on April 23, 1932. [*"Times"*

As an example of modern architecture, a description of England's first skyscraper is given here. This building, the architect's drawing of which appears opposite, is to be erected at Blackpool, and will certainly be a noble companion for the Tower. If you examine the drawing you will note how the building rises in blocks around a central tower.

WHEN a building is contemplated the building owner selects an architect to carry out his wishes. In an ordinary building the steel framework necessary to hold the building together and make it stiff is usually strong enough to include wind pressures without calculations, but in a high building wind pressures are very important factors and special calculations are necessary to prevent the tower being "corkscrewed." You will notice that horizontal bands run around the tower; behind these bands are compound girders which act as stiffeners. There are also wind braces running diagonally across the tower supplemented by knee brackets. The top of a tower is subject to more strains and stresses by sudden squalls high up above the earth than is the bottom, hence these stiffeners are placed closer together.

HOW THE ARCHITECT BUILDS UP HIS PLAN ON PAPER.

The architect prepares plans of every floor, and these must be very accurate, with all the dimensions shown so that all the trades can make their arrangements and get their building materials ready. All openings and pipe runs for service pipes, ventilating shafts, staircases, escalators and lifts are carefully worked out and rigidly adhered to. In fact, the drawings are the most important documents on the building, as they convey to all the trades exactly what the architect has had in his mind in designing the project, and in a building of this magnitude the detail work on the working drawings is very exacting and intricate. You will, of course, know that it would never do for the plumber to come along when the building is half up and say, "I want a hole cut here." This hole might be in a very vital place and affect the stability of the structure. Hence the necessity of actually "building the project" on paper in the architect's office before a man appears on the site. The architect must therefore foresee everything.

HOW AN ARMY OF WORKERS RELIES ON THE ARCHITECT'S PLAN.

Next a time-table is prepared in chart form which shows week by week how the various trades will start and complete their work, and it is as necessary to adhere to this chart as it is for a railway time-table to be adhered to.

Full-size drawings are made at the foundry of all steel work, the steel is cut to dead lengths and holes drilled in the designed positions. This steel is then taken to the site and large jib cranes hoist it into position. Bolts and rivets are placed in the holes and the work proceeds just as a toy is erected on a dining-room table, until the whole framework is complete. Next floors are placed in position, then walls erected to keep out wind and rain. *Now an amazing thing happens.* A whole army of men appears, erectors place lift guides in position, plumbers with pipes, heating and ventilating engineers with pipes and ducts, electricians with miles of wire, plasterers and tilers, *all working to the chart* and arranging their materials in the appointed places according to the way in which the architect has made his drawings.

HOW THE WATER SUPPLY FOR A SKYSCRAPER IS REGULATED.

Water supply is a complicated business. Pressure in a pipe rises in the proportion of half a pound per square inch for every two feet of height, which means that in a pipe 500 feet high there would be $\frac{500}{2} \times \frac{1}{2} = 125$ lbs. per square inch, consequently pressure-reducing valves are necessary to reduce this to a normal working pressure of about forty pounds per square inch.

Expansion and contraction in steam pipes and service pipes is taken up by loops in the system. By increasing the pressure in a steam pipe water turns into steam at a higher temperature than 212° Fahrenheit, and by drawing air from the pipe and so reducing the pressure water turns into steam at a lesser temperature than 212° Fahrenheit. This pressure is regulated by automatic thermostats that govern the temperature, making the rooms cosy yet healthy at all times and seasons.

THE "SUN" WILL SHINE AT THE TOP OF THIS GREAT BUILDING.

Gravity has to be counteracted in the waste water drainage system to prevent the high speed of falling water. It would never do to allow gravity to have its own way, or the result would be disastrous.

If you look at the picture on page 650, you will see that the building is set back in tiers from bottom to top. This allows flood lighting to play an important rôle. The " sun ball " at the top will be lighted with bright orange rays, and reflected light will appear through the slots in the square section below the ball. Directly behind these slots are water tanks for the water supply.

The total height of the building will be 511 feet above the general level of adjoining land. This is roughly the height of Blackpool Tower.

The " sun ball " is 27 feet 6 inches in diameter and will appear like a " sun " when lighted.

Trough lights will be installed around all parapets and tower balconies to light up the main architectural features of this original building.

Buildings of this type in England open up a new field for this country, and through time giant skyscrapers may rise in our cities, adding to them a touch of variety and stateliness.

An example of modern architecture is seen in this picture of County Hall, Westminster, which is the headquarters of the London County Council, on the bank of the river Thames. There is dignity and simplicity in this new style of building, which makes a majestic looking picture when viewed from the other side of the river.

MORE FOLK STORIES OF THE NATIONS

Our last quartette of folk stories comes from nations scattered over the surface of Europe. Ireland gives us one of its jolliest tales, while the far north contributes the story of a man who became a star. The Cossacks provide the tale of the cunning of an old dog and a wolf, while from Sweden we have the fairy tale of Mother Big-Foot's method of helping a Princess.

THE THREE LITTLE WOMEN

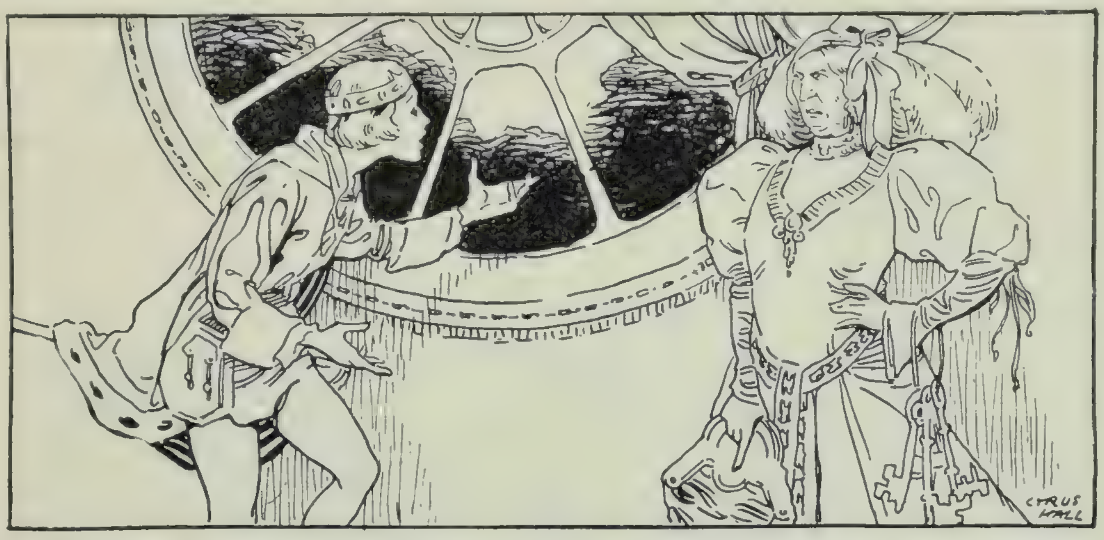
ONCE upon a time there was a young Prince who had fallen in love with a fair Princess. But it was whispered that the Princess was much fonder of pleasure than of work.

Now as the young Prince's mother was very fond of work and could do all manner of things extremely well, she did not care much for the fair Princess.

"I do not think she will make you a good wife," she said to her son.

"Of what use is a wife who cannot cook or weave or sew?"

"But she can dance beautifully, and her voice is as sweet as any nightingale's," said the poor Prince.



"I do not think she will make you a good wife," she said to the Prince.

"That may be, my son, but she shall not marry you unless she can perform well three tasks which I will set for her myself."

HOW MOTHER BIG-FOOT HELPED THE PRINCESS WITH HER FIRST TASK.

The young Prince felt that his mother was very unkind, but he went to the Princess and told her all that the Queen had said.

The Princess agreed to go to the Queen and receive her tasks. The Queen took her to a room in a tower. There was nothing in the room but a large spinning-wheel and a pound of flax.

"This flax must all be spun before dawn," said the Queen. "If you cannot do it then you must give up all hope of marrying my son."

So saying, she left the room and turned the key in the lock behind her.

The poor little Princess sat down and began to cry.

"How shall I ever do it?" she sobbed. But just as she said this, she heard a gentle tap-tapping at the window. She opened it, and in walked a queer-looking old woman. Her feet were very long, although the rest of her body was quite small.

"Peace be with you!" said she.

"And peace be with you, too!" said the Princess. "But who are you and whence do you come? I have never seen you before."

"My name is Mother Big-Foot. But tell me, why are you so sad, fair maiden?"

"I may well be sad. You see this flax and this spinning-wheel. The Queen declares that she will never consent to my marriage with her son unless I can spin all this flax into yarn for her before dawn."

"Rest content. I will do it all for you, if you will grant me one thing in return."

"What is that?" asked the Princess eagerly.

"That you shall invite me to your wedding and call me your friend."

"Certainly I will," said the Princess, overjoyed. Then she sat and watched Mother Big-Foot spinning, until her head nodded and her eyes closed in sleep.

Long before morning, there was the yarn as white as snow and as fine as a cobweb. The little old woman had disappeared, and just as the young Princess was picking up the yarn, in came the Queen.

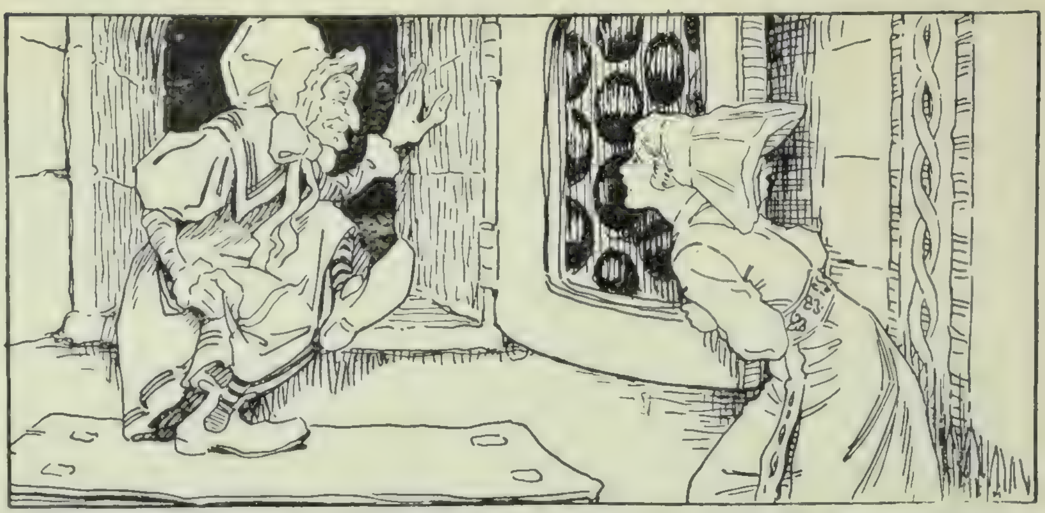
"Well, I suppose the task is not finished yet," she said.

"Oh, yes, it is finished, as you see for yourself," and the Princess handed her the yarn.

MOTHER BIG-THUMB ARRIVES AT THE RIGHT MOMENT TO DO SOME WEAVING.

The Queen was greatly surprised.

"I did not expect to find it finished. It is well done, too. Now I will give you your second task. All this yarn must be woven into cloth before the cock crows at dawn. And mind, if it is not done, then you must give up all hope of ever marrying my son."



" My name is Mother Big-Thumb," said the queer-looking old woman, climbing in through the window to help the poor princess with her task.

Then she left the room again, and locked the door as before.

" Oh, dear! Oh, dear! I cannot weave at all. What shall I do ? " But as she sighed thus, again there came the gentle tap-tapping at the window. She ran to the window and opened it, and in came another little old woman. This one had such large thumbs that it made her look quite strange.

" Peace be with you ! " said the old woman.

" And peace be with you, too ! " said the Princess. " But tell me who you are, and whence you come."

" My name is Mother Big-Thumb, because my thumbs have grown so large, as you see. But why did you sigh as I came in ? "

The Princess showed her the yarn and told her that it had to be woven into cloth before dawn.

" I will weave it for you, and I will do it well, if you will do one thing for me. Invite me to your wedding, and call me your friend."

The Princess thought it was all very strange, but she said that she would, and then Mother Big-Thumb began to weave.

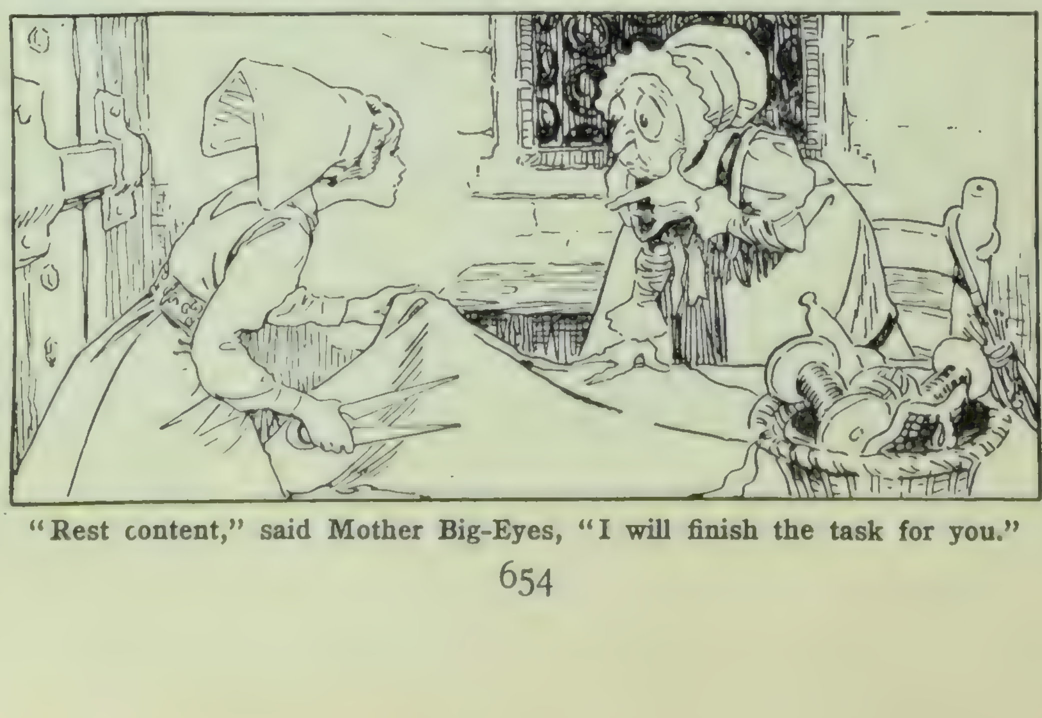
THE QUEEN IS VERY SURPRISED TO FIND THE SECOND TASK FINISHED.

In and out her fingers flew until at last the little Princess could keep awake no longer. Her head sank on to her breast and soon she was fast asleep.

She awoke again just as the cock was crowing at dawn.

Mother Big-Thumb had disappeared, but she had left behind her a beautiful web as finely made as any one could wish.

The old Queen unlocked the door and entered.



"Rest content," said Mother Big-Eyes, "I will finish the task for you."

" Well, I suppose the second task is not finished yet," she sneered.

" Oh, yes! Here is the cloth ! " and the Princess handed it to her.

The Queen could hardly believe her eyes.

" Here is yet a third task," she said. " This cloth must be cut into shape and stitched to make a shirt, fit for my son to wear. If it is not done by cock-crow to-morrow morning, then you shall never marry my son."

THE THIRD OLD WOMAN ARRIVES TO THE PRINCESS'S RESCUE.

Again she left the room and locked the door behind her. This time, the Princess ran to the window, feeling sure that a third little woman would be there. But, alas ! she could see nothing at all but the tops of the trees waving in the breeze.

But when night fell, there came again the tapping at the window. Eagerly the Princess ran to open it, and sure enough, a third little old woman came hobbling in. This one had eyes that were as large as saucers, and it gave her a very strange appearance.

" Peace be with you, gentle maiden ! " said the old woman.

" And peace be with you ! " said the Princess.

" Tell me why you look so sad ? "

" I may well look sad. I have this tedious task to perform before I can ever hope to marry the Prince," said the Princess.

" Rest content. I will finish the task for you before cock-crow to-morrow morning, if you will promise to invite me to your wedding feast, and say that I am your friend."

" You are

indeed kind. Of course I will invite you."

And the little Princess clapped her hands for joy. Then she lay down and slept whilst Mother Big-Eyes worked.

All night long she cut and shaped and stitched, and of course long before the Queen came into the room the shirt was ready and fit for the Prince to wear.

HOW THE THREE OLD WOMEN SAVED THE PRINCESS FROM A LIFE OF DRUDGERY.

The old Queen could not help showing her disappointment. She had not expected the third task to be finished. But she could not go back on her word, and so she had to allow the Princess to marry her son.

Preparations were made for the marriage feast, and joy was everywhere.

When the feast was at its height, in came Mother Big-Foot, Mother Big-Thumb, and Mother Big-Eyes.

" What strange-looking old women ! " cried the King. " Who can they be ? "

" They are friends of mine. I invited them," said the Princess.

" Indeed ! " said the King, and he went over and spoke to them.

" Do you see my big feet ? " said Mother Big-Foot.

" I do."

" Well, they are so big because I have had to work so hard at the spinning-wheel all my life."

The King was greatly interested.

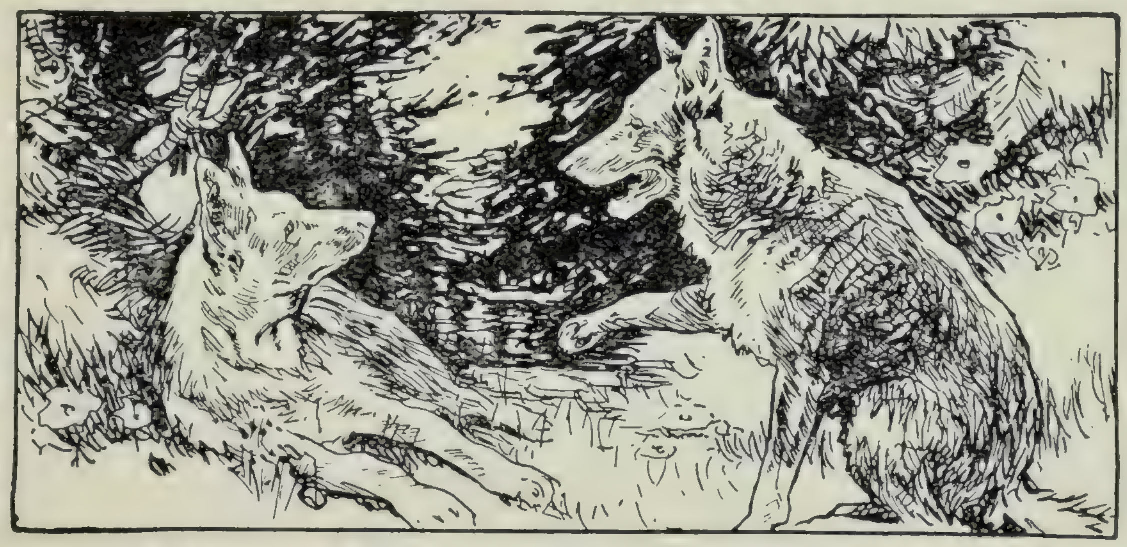
" And I," said Mother Big-Thumb, " I have such large thumbs from hard work at my weaving."

" And I," said Mother Big-Eyes, " I have such large eyes from working so hard at my sewing."

" Dear me ! " said the King. " Then, if that is so, I will not allow my new daughter-in-law to do hard work of any kind for the rest of her life ! "

So the Princess was only allowed to sing or dance or play, and she became the best dancer and the sweetest singer in that kingdom.

THE UNGRATEFUL MASTER


" How are things with you, my friend ? " asked the big gray wolf.

A MAN once owned a dog. When the dog was young and strong and could do all kinds of work, his master made a great fuss of him. The dog was petted and well fed, and he was allowed to sleep in the kitchen when the nights outside were cold.

But when he grew so old that his teeth dropped out and he could work for his master no longer, the bad man grew unkind. He refused to give him any food, he beat him, and at last he drove him away from the house.

HOW THE WOLF TRIED TO MAKE FRIENDS WITH THE HOMELESS DOG.

The poor old dog trotted sadly off to the wild wood. There he met a huge, gray wolf. At first he was afraid, for he was old and weak, but the wolf proved to be very friendly.

" How are things with you, my friend ? " he asked.

The dog replied :

" Oh, very bad indeed ! My master is most unkind to me. Now that I am old and can work no longer, he beats me and will not give me any food. Yesterday he drove me away, and now here I am ! "

" Oh, that is too bad ! " said the big wolf. " Your master should be taught a lesson. Perhaps I can help. Listen to my plan."

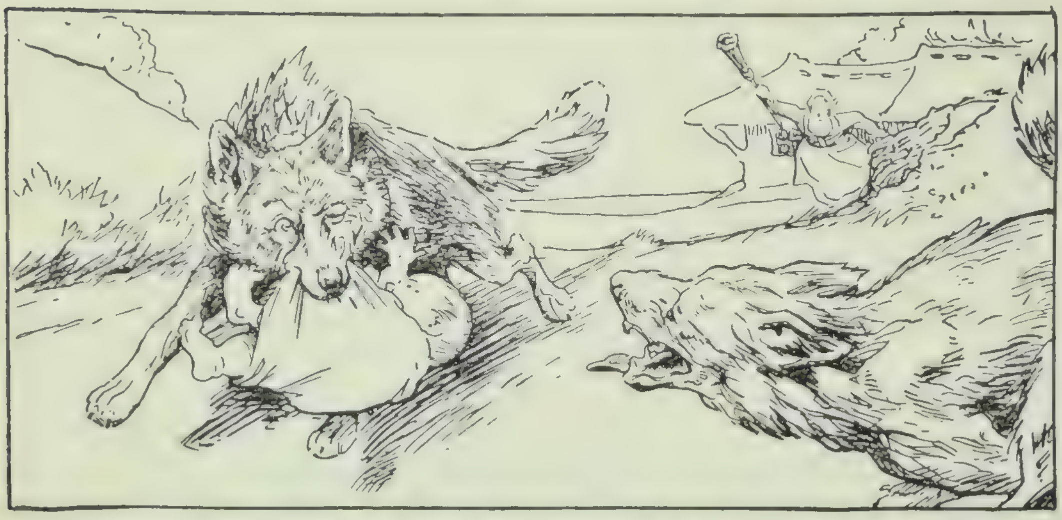
The dog pricked up his ears and listened. Then said the gray wolf :

" Every morning I notice that your mistress puts the baby in its cradle outside the back door whilst she is getting on with her work."

" Yes, so she does ! "

" Well, to-morrow we will watch, and as soon as she has left the baby outside I will run up, snatch the child from the cradle and pretend to run away with it. Then you must run up and chase me. Bark as loudly as you can, so that your mistress will hear you. Then she will run to see what is happening.

" Although you have no teeth, you must



He seized the child in his jaws and ran off with it towards the wood.

tousle my fur and pretend to be attacking me. Then I will drop the child and run away. Your mistress will be sure to tell her husband all she has seen, and then he will, no doubt, treat you well."

"That will be an excellent idea," said the dog. "We will do as you suggest."

THE WOLF GIVES THE POOR MOTHER A FRIGHT BY STEALING HER BABY.

Next morning, the wolf and the old dog waited and watched. As soon as the woman had put her baby outside the back door, the wolf bounded forward.

He seized the child in his jaws and ran off with it towards the wood. Up came the dog.

"Bow-wow! Bow-wow!" he barked as loudly as he could.

He gave chase to the wolf. Out came the mother, carrying her broom. When she saw what had happened, she was terrified.

"Husband! Husband!" she cried. "Come quickly! The wolf is taking away our baby. Ah! Ah! Ah!"

HOW THE POOR DOG LIVED HAPPILY EVER AFTER.

But the husband was far away in the forest and did not hear. Away ran the woman, crying, and waving her broomstick. Then she saw the old dog catch up with the wolf. He buried his jaws in the wolf's shaggy coat and seemed to be attacking him most bravely.

"Ow!" yelped the wolf. "Ow! Ow!" He dropped the baby and ran away. He was soon lost to sight in the wild wood.

The woman was filled with joy when, panting, she arrived on the scene, and found her baby unharmed.

"Good dog! Good dog!" she exclaimed. "I will tell your master when he comes home. He will be much kinder to you when he hears about all this."

And of course he was. Every day after that the dog was well fed and petted, and so he lived happily for the rest of his life.

LITTLE LUSMORE

At the foot of the Galtee Mountains there once lived a poor little man with a large hump on his back. He earned his living by plaiting rushes and making them into baskets and hats.

The village folk called him Lusmore, because he always wore a sprig of that little purple flower in his hat.

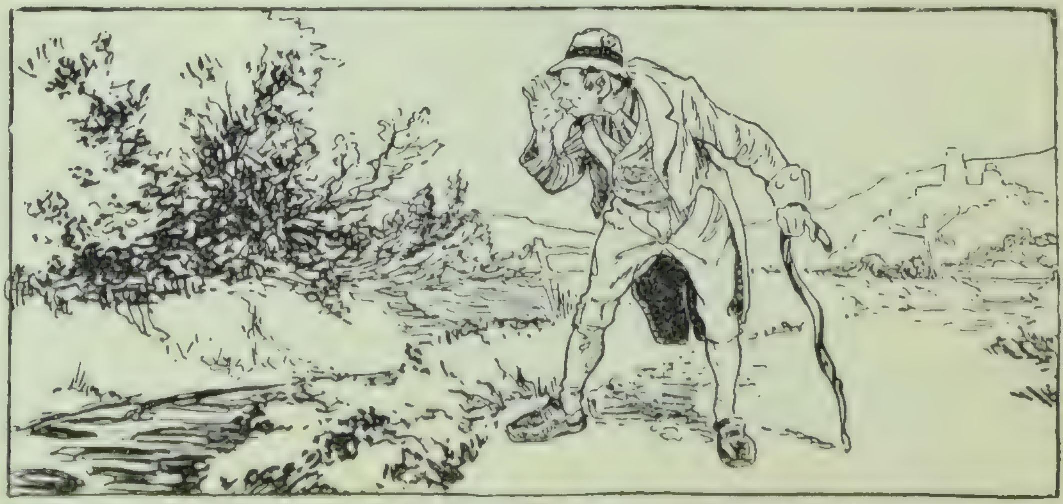
One night when Lusmore was returning from town, walking very painfully and slowly, as usual, he happened to pass by a deep moat. He heard what he thought to be fairy voices singing in the moat.

All the words of their curious little song seemed to be: "Monday, Tuesday, Monday, Tuesday, Monday, Tuesday," as far as Lusmore could make them out.

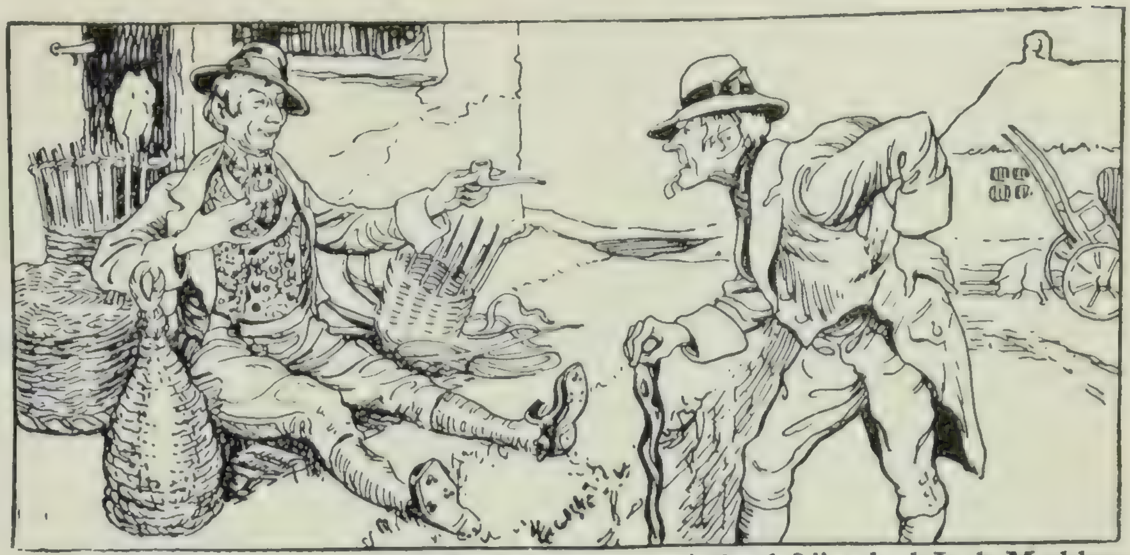
So when the fairies paused for breath, he added in his sweet singing voice: "Monday, Tuesday, and what about Wednesday?"

LITTLE LUSMORE IS SEIZED BY THE FAIRIES AND DRAGGED INTO THE MOAT.

He raised the tune as he did so. Then to the little man's surprise, no sooner had he sung this, than the fairies seized him in their



"Monday, Tuesday, and what about Wednesday?" sang the old man to the fairies who lived away under the deep moat.



"What has singing to do with the hump on one's back?" asked Jack Madden peevishly. "How can I sing when I have to drag this weight about?"

tiny arms, and bore him down through the water.

Down, down, down he sank, and when next his feet touched ground, he gazed around him in wonder.

He was in the finest fairy palace you could wish to see. Crowds of dainty fairies were bowing and nodding and curtseying to him as if they were well pleased to see him.

"And what is the meaning of all this, I should like to know?" said Lusmore, when at last he was able to speak.

Then one of the fairies stepped out from the rest and sang:

"Lusmore! Lusmore!
We will love you evermore,
To our song you added more.
Now the hump that once you bore
On your back shall be no more.
Look down upon the floor,
There you'll see it, Lusmore!"

Lusmore looked down, and there sure enough was the ugly hump!

LUSMORE IS DELIGHTED TO FIND THAT HIS HUMP HAS DISAPPEARED.

He felt between his shoulder blades, and lo! his back was as straight as a rod. His joy knew no bounds.

The fairies then led him up through the water again, and he found his way home, though he never remembered how he got there.

In the morning the village folk were all greatly surprised to see him looking so sprightly.

"However did it happen? Tell us all about it," begged the gossips.

So Lusmore told them as well as he was able, for indeed he felt that he was still in a dream. The news travelled far, as such news will do in country districts. One day a certain Jack Madden, who also had a hump on his back, came to see Lusmore and to seek his advice.

"They say that the fairies took your hump away, Lusmore. Do you think they would do the same for me?"

"Well, I should say it would depend on you. Can you sing?"

"What has singing to do with a hump on one's back? How can I sing when I have to drag this weight about?" said Jack Madden crossly. He had always been a peevish creature from his birth.

"Well, I will do this for you," said Lusmore. "I will take you to the spot where I saw the fairies, and leave you there, at nightfall. When the fairies pause in their singing, you add, 'And what about Wednesday?' That is what I did."

THE FAIRIES ARE VERY ANGRY WITH JACK MADDEN FOR SPOILING THEIR SINGING.

So Jack Madden sat by the moat until nightfall, and when the fairies began to sing, "Monday, Tuesday, Monday, Tuesday," as before, cross old Jack Madden put his hands over his ears, and shouted:

"Change the words a bit, can't you? I'm tired of hearing the same thing over and over again."

Then the fairies grew angry. They swarmed out over the edge of the moat, seized Jack Madden, and bore him down to the depths below, crying, "You spoiled our singing! You spoiled our singing!"

INSTEAD OF GETTING RID OF HIS HUMP, THE FAIRIES GIVE HIM ANOTHER.

Then one of them stepped out from the rest and sang:

"Jack Madden! Jack Madden!
Your voice came so bad in
The tune we felt glad in,
That your life we will sadden.
Take two humps, Jack Madden!"

Then they sent him up through the water, and when his feet touched dry ground again, there he stood with two humps upon his back, instead of one as before. And so for the rest of his life he had to remain!

THE MAN WHO BECAME A STAR

OF all the stars that shine in the sky, the brightest is the one which we call Venus. The Eskimo children call it by a name which means "The-Old-Man-Who-Stands-And-Listens." This is the story of how it received that name :

Once upon a time in the land of ice and snow, there lived an old man. He was much disliked in his own village, for he was always so cross and ill-tempered. So cross was he that he could not bear to hear the laughter of little children at their play.

If he heard them playing at "cup-ball" outside his snow-hut, he would rush out and drive them away with his dog-whip. Needless to say, he lived alone, for no wife would have put up with his bad temper.

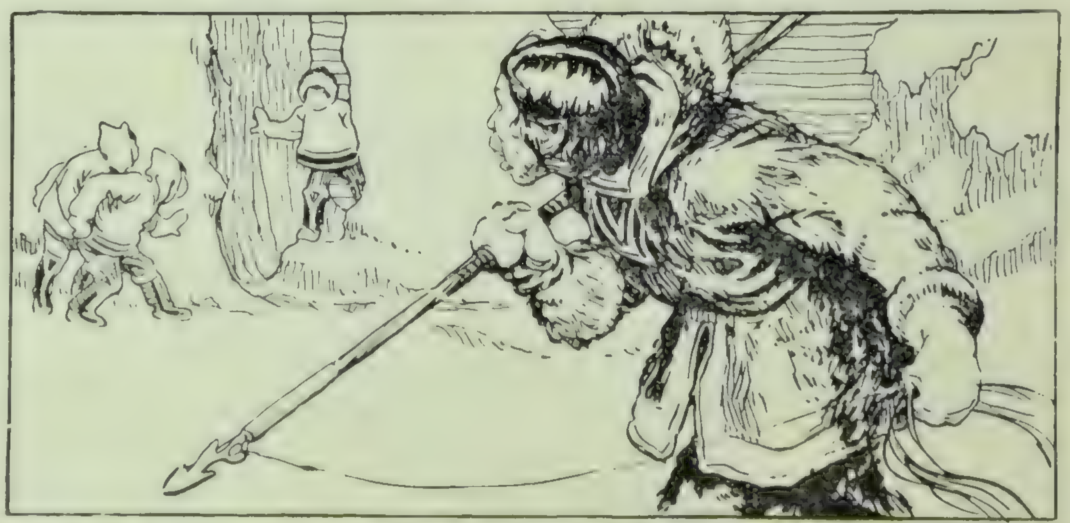
HOW THE ANGRY OLD MAN MADE THE ROCKS CLOSE OVER THE CHILDREN'S HEADS.

One day the old man took down his harpoons and went out over the ice to hunt the young seal. When he came to a hole in the ice, he waited there for a long time, standing and listening for the sound of the seal.

There were some children playing near him. They stood in a passage between two high rocks of ice. Each time the seal came up to breathe, the noise of the children's laughter frightened it, and it turned back into the water again. This made the old man so angry that he rushed at the children with his spear and told them to go away.

Now the children knew the old man well for the "cross-patch" that he was. So they took no notice of him. At last the old man became so very angry that he called up the magic spirits of evil, and said, "Those children are spoiling my catch with all their noise. Close up the rocks between which they are playing, that I may hear their noise no more!"

Then a terrible thing happened. In less time than it takes to tell, the evil spirits fell upon the two rocks of ice and closed them right up, over the children's heads! They could not get out, neither could any one get in to help them.



The old man was so angry that he rushed at the children with his spear.

THE CHILDREN TRY HARD TO ESCAPE FROM THEIR ICY PRISON.

There was only a narrow crack at the top through which the gray sky could be seen. Shut in like this, the poor little children began to cry loudly. They called for help, but no one could hear them. Poor little things, their plight was terrible!

"What shall we do?" cried one. "We have no food. We shall be starved to death."

"See, there is a crack away up at the top of the rock!" cried a brave one. "Let me try to climb and get through it. Then I might call for help."

So the brave boy stood on another's shoulders and from here he tried to climb up. But the sides of the rock were of ice and were much too slippery. His poor hands, too, were numb, and he could not even cling on. After making several attempts he fell down, too exhausted to move.

Then the children sat down together and began to cry more loudly than ever. The little gulls who were flying overhead were the only ones who heard them. So they fetched small scraps of food and dropped them down the crack to the children below. The children picked up the scraps eagerly and ate them, but these did not satisfy their hunger.

HOW THE GOOD SPIRITS CAME TO THE AID OF THE POOR CHILDREN.

Now, as time went on and they did not come home from their play, their parents grew anxious. They went out over the ice to search. They went out in their "kayaks" over the sea. They went farther inland. But they could not find them anywhere.

At last the children began to pray. They called up, by their prayers, the good spirits that dwell in the sea.

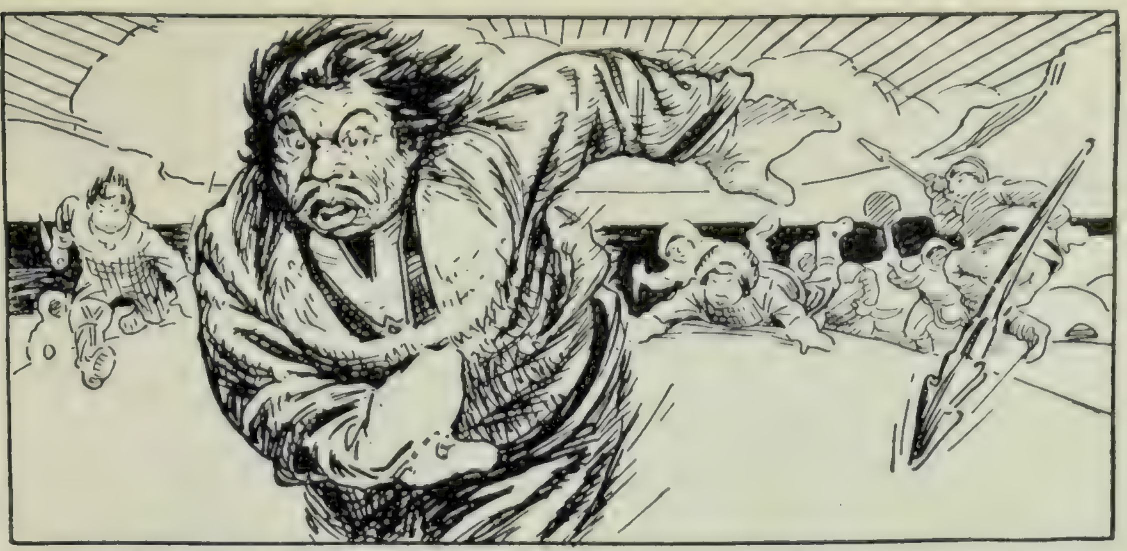
The good spirits came to their rescue. They bored a long tunnel through the rock of ice and helped the children out, more dead than alive.

You can guess how glad they were to be free, and with what joy their parents welcomed them home!

"But how

did you come to be shut in by the rocks?" they asked.

The children did not know. They could only tell about the cross old man who was waiting for his seal.



Away and away he ran, with the angry village folk in hot pursuit.

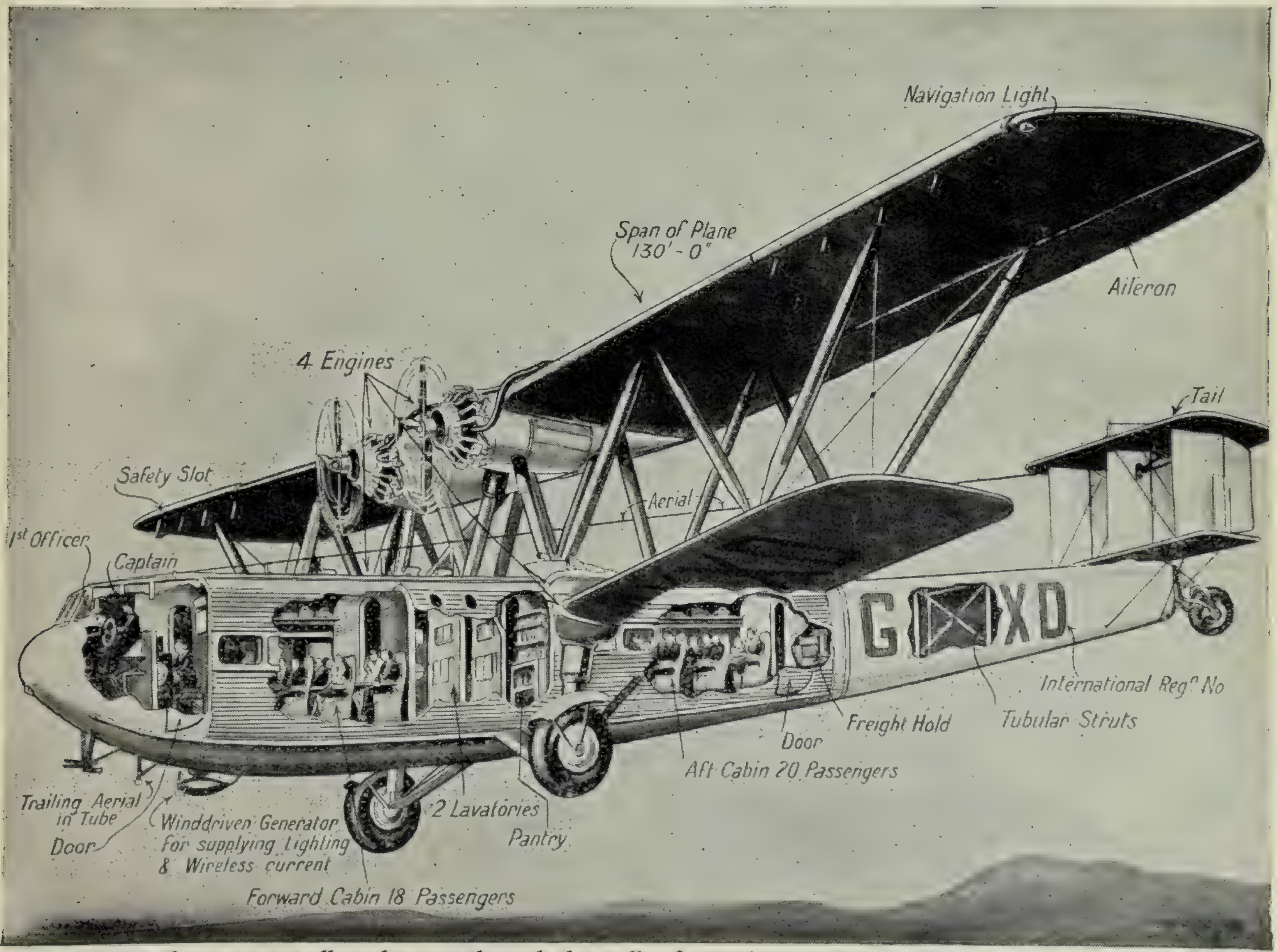
Then the people rushed to the old man's hut. They took their knives with them to kill him. But the old man saw them coming and immediately he ran away. Away and away and away he ran, with the village folk in a body tearing after him in hot pursuit.

But the good spirits of the sea came too.

"You bad old man," they cried. "Your punishment shall be that you must stand still for ever and listen."

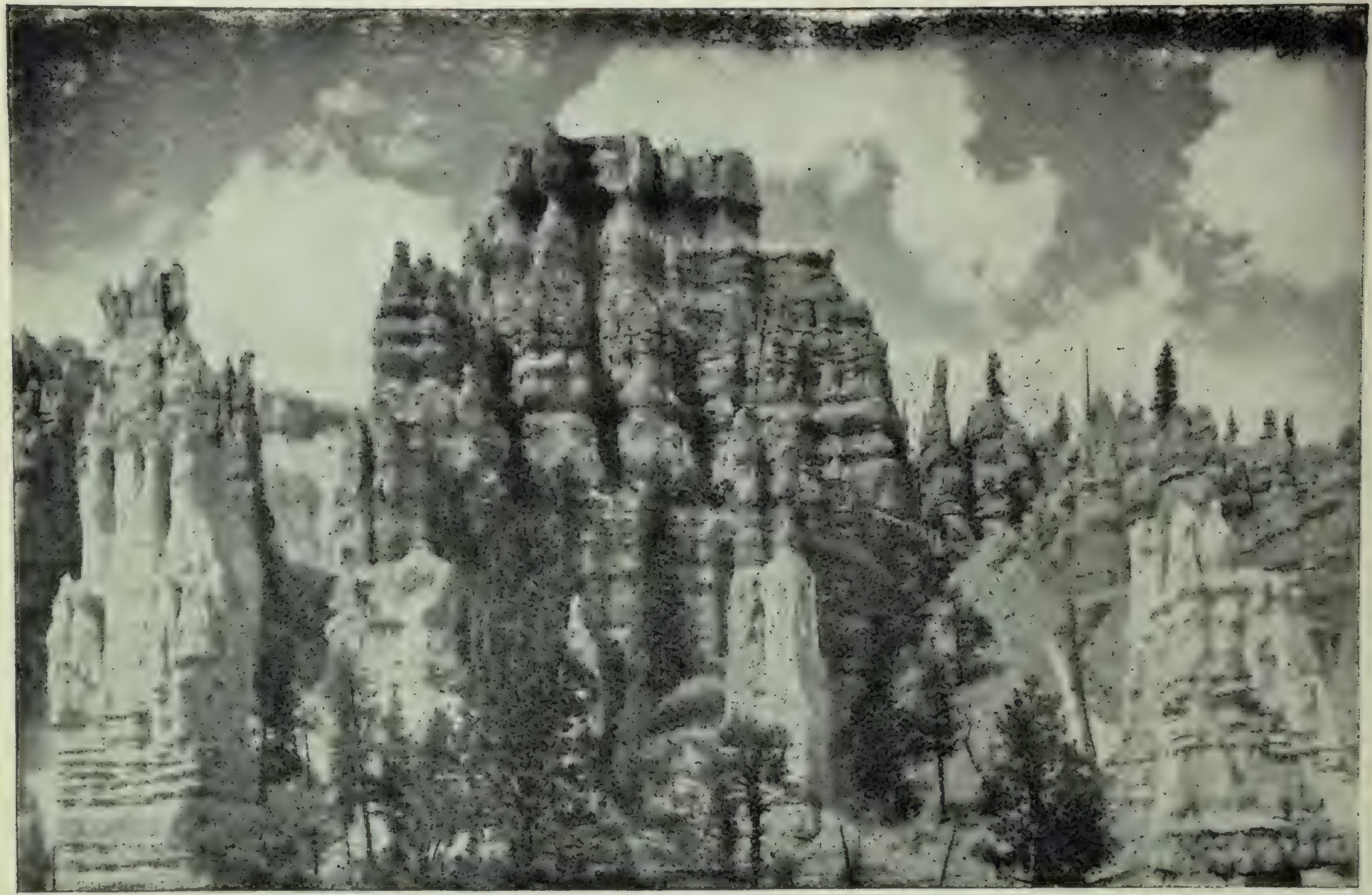
As they spoke, the old man's clothes began to shine. He was changing into a star! He rose and rose into the northern sky, but he did not go very far. He hung low. And there to this day the old man stands and listens in the sky! The children call him Nalaus-sartoq.

LOOKING INTO A MODERN AIR-LINER

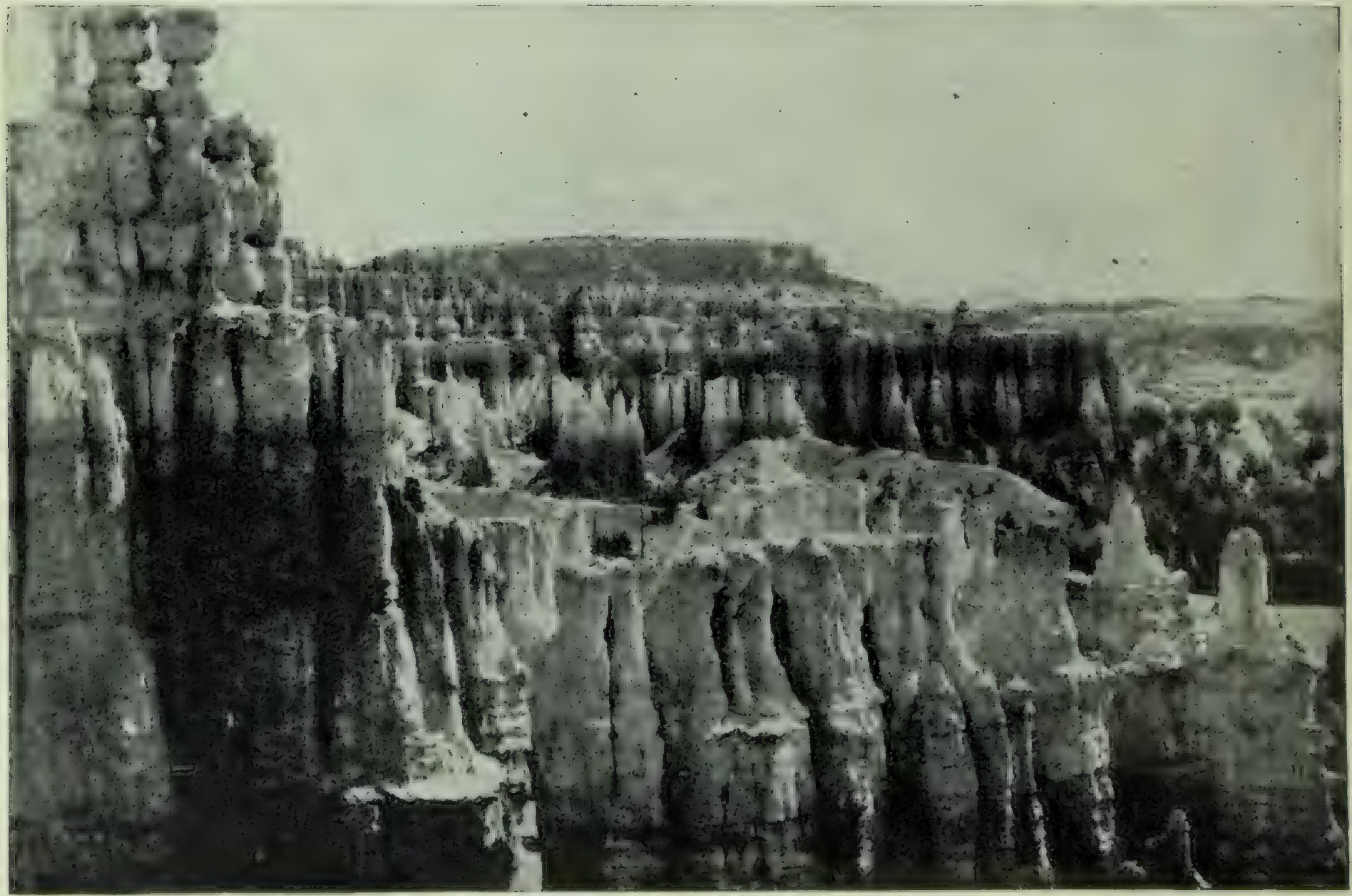

Navigation Light
Span of Plane 130'-0"
Aileron
4 Engines
Tail
Safety Slot
Aerial
1st Officer
Captain
G XD
International Regn No
Tubular Struts
Freight Hold
Door
Aft Cabin 20 Passengers
2 Lavatories
Pantry
Trailing Aerial in Tube
Door
Winddriven Generator for supplying Lighting & Wireless current
Forward Cabin 18 Passengers

In the picture above we are allowed to see through the walls of a modern air liner as it flies along with its passengers. You will notice how cosy is the interior, and how the cabin space is distributed before and behind the wings. Over forty people are travelling in the liner, as well as baggage, and every one has a comfortable seat.

A FAIRY PALACE IN WESTERN AMERICA



In the great basin of Bryce Canyon there are many beautiful styles of architecture represented. You can see temples, pagodas, and pyramids in this canyon, which is crowded with many strange and wonderful forms. The above scene is known as Queen's Castle. The lacy pinnacles are streaked with a very definite red, worn away by the weather.



The above has been named the Temple of Osiris because of its likeness to the ancient temples of the Egyptians. Imagine looking down on this beautiful scene graven in pink and white sandstone, on the edge of an immense tableland, at Bryce Canyon. This beautiful scene, one of Nature's many wonders, is like a glimpse of fairyland.

TWO NATURAL MARVELS

Everything around us points to the fact that Nature is a worker of miracles. Every tree that grows and each tiny bud that blossoms is a wonder far above those wrought by man's scientific mind. And this force that works so silently, yet so energetically, has at times excelled itself and produced marvels that are even more wonderful than those we have come to take for granted every day. An interesting story can be read below of how the wind and the rain wore down the earth's surface and built enchanting palaces of fairy-like beauty. You read, too, of how a visitor from space struck the earth thousands of years ago, leaving a great cavity to mark its resting-place. What fairy-tale could be more entrancing ?

IN Southern Utah, in Western America, may be seen the most startling example of the forces of *erosion*, that is, a wearing down of the earth's surface by wind, rain and other natural causes. Here, amid wild and rugged country, far from any city or centre of civilisation, are two rightly famed wonder spots, Cedar Breaks and Bryce Canyon. Apart from the fantastic shapes which wind, rain and frost have worked upon the sandstone cliffs at the places named, there is also their wonderful colouring, sculptured rocks, as it were, presenting all the colours of the rainbow.

THE GIANT BOWL MADE OF COLOURED SANDSTONE IS ONE OF THE BEAUTY-SPOTS OF THE WORLD.

Cedar Breaks lies on the edge of the Markagunt Plateau and, like Bryce Canyon, has only recently been made accessible to tourists by the Union Pacific Railway. Indeed, until a year or so ago it meant several days' journey by pack mule to reach these natural wonders, which almost baffle description. Imagine a brilliantly-lighted, crescent-shaped amphitheatre, or rather a series of amphitheatres, of colossal dimensions, sculptured in the most entrancing way, and adorned in gorgeous colouring, stretching away in the distance as far as the eye can reach. Then you have a faint idea of the immensity and wonder of Cedar Breaks. In design this mass of coloured sandstone has the appearance of a giant bowl, measuring over two miles across, sloping away to a depth of two thousand feet, covering about sixty square miles of area.

THERE ARE MORE THAN SIXTY DIFFERENT TINTS AT CEDAR BREAKS.

From the rim, which stands at a height of ten thousand feet above sea-level, can be seen a hundred miles of vast terraces that appear to rise like promontories in a sea of dazzling colours. More than ten thousand feet of strata (or layers of rock) are exposed at Cedar Breaks. It is " a library of the ages in vivid bindings," for here in the dim, distant past there have been terrible upheavals and mighty displacements of the earth's crust, when sea-bottom has been made to change places with mountain top.

Its display of colours is amazing. It looks as if some giant hand had freshly painted it in fairly even streaks. The work of wind, rain, sand and frost has produced all kinds of grotesque and magnificent cathedral-like forms, rising from long, wedge-shaped base courses of white and orange. The colours change marvellously in the sunshine ; sometimes pink or terra-cotta, and at other times orange. The colour scheme is pink, terra-cotta, mulberry, red, orange, yellow, white, lavender and purple, with glimpses of many other tints and hues. Then at the edges of these sculptured, coloured cliffs are the green of the spruce, fir and pine trees that line either side, and also dot the edges of the rim above. An artist has counted more than sixty tints at Cedar Breaks.

HOW AN OLD STOCK RANCHER DISCOVERED THE BEAUTIES OF BRYCE CANYON.

Sixty miles away lies Bryce Canyon. One reaches it after a thrilling ride through Red Canyon, a weird place dotted with huge boulders and rocks, with here and there narrow openings. It has been the scene of many a stern fight, for in the days of banditry it was the meeting place of railway express robbers.

Like Cedar Breaks, Bryce Canyon is a vast amphitheatre of horseshoe shape, graven a thousand feet deep in the pink and white sandstone on the edge of an immense table-land. It takes its name from Bill Bryce, an old pioneer and stock rancher. So far as is known, he was the first white man to behold its beauties. Some of his stock had strayed, he traced them to the canyon and reported its existence, though declaring it was a terrible place in which to lose a cow !

Although there is a similarity between Cedar Breaks and Bryce Canyon, the latter is much more compact and more delicate, and far more crowded with strange and wonderful forms. It is, in fact, the most astonishing blend of exquisite grandeur and beauty ever wrought by the forces of nature. It is three miles round the rim, and one peers over a bewildering mass of architectural forms and fantasies—spires, columns, monuments, statues and long spidery-like walls—tipped with the brush of a true artist. Red and terra-cotta are the chief colours, and for this reason Bryce Canyon has been termed "the canyon of fire!" But there are other colours—pink, lavender, purple, white, orange and yellow, to name but a few.

BEAUTIFUL BUILDINGS WITH DAINTY DESIGNS ARE TO BE FOUND IN THE CANYON.

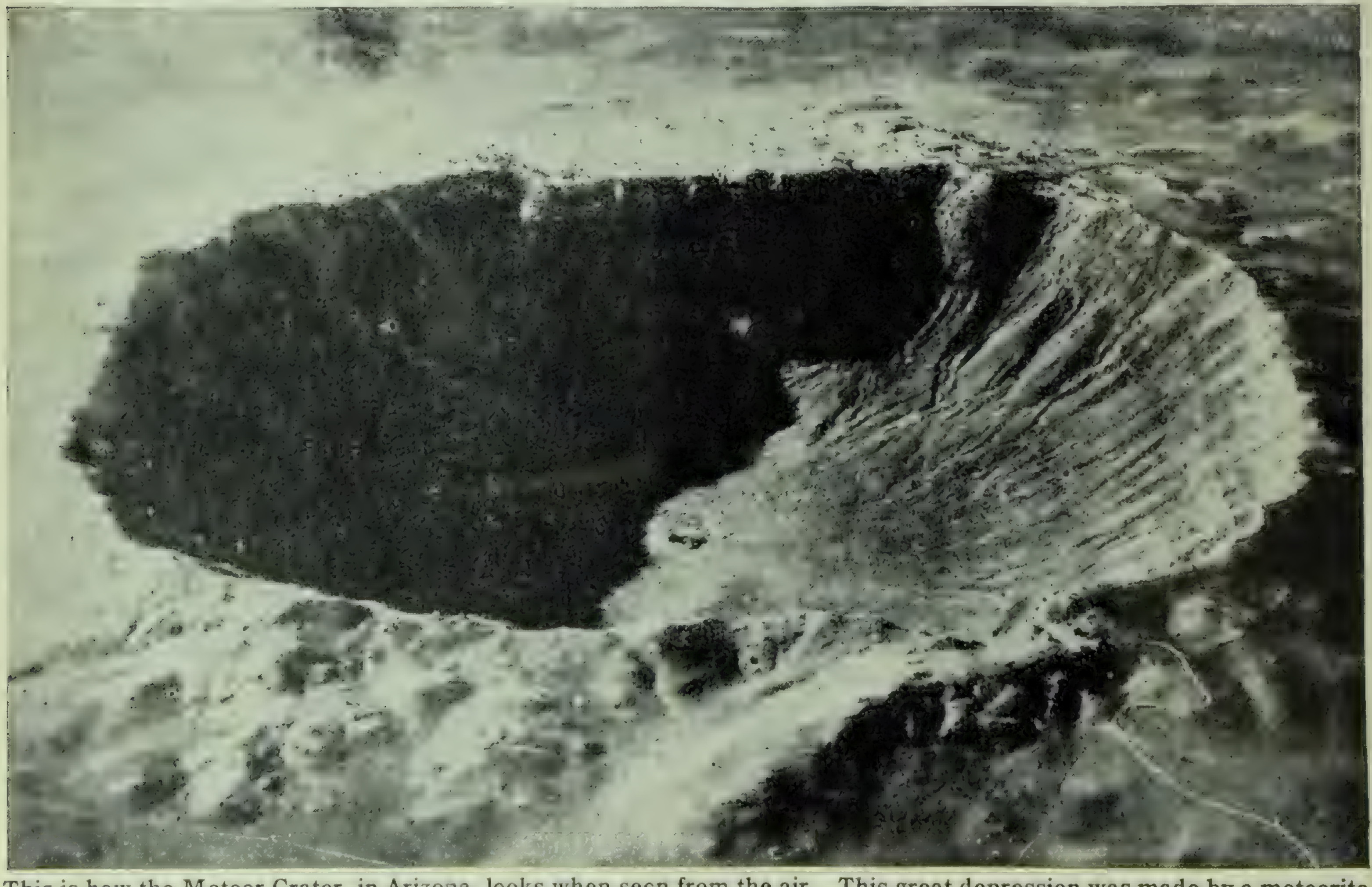
In this great glittering basin we have every type of architecture—castles, cathedrals, temples, pagodas, pyramids, mosques, leaning towers, colonnades, stairways, walls with niches and windows. Spires, columns, obelisks, singly and in groups, are everywhere, some of them tipped by slabs, cones and bells. The architects of old might well have drawn their inspiration from the silent city of Bryce. And in this dream city are weird inhabitants statued in variegated stone; giants and gnomes, kneeling priests, marching soldiers and many animal forms—figures that seem to move in the shifting play of light and shadow.

Quite a number of trails lead down from the rim into the depths of the canyon, and a trip among the maze of rising pinnacles is a weird experience. Lacy designs and dainty figures, as seen from the rim, seem to grow to giant size when one is among them. There are sunless grottos and vaults, artists' studios filled with half-finished models and figures; innumerable fantastic forms in bronze, jasper, ruby, topaz and alabaster effects. Each turn in every aisle and alley on Bryce's intricate floor has its charming revelations of contour and colour.

FOLLOWING A FALLEN METEORITE

OUT on a dreary wind-swept plain in Arizona lies a huge depression, known as Meteor Crater—the largest known tomb of a meteorite. The tomb gives evidence that a mass of metal many thousands of times larger than any of the meteorites seen in the museums dropped from the skies near Canyon Diablo, in Arizona.

Specimens of these missiles occasionally break through the atmosphere which envelops the earth, and are to be seen in the leading museums. They vary in weight from a few ounces up to several tons, the largest that has been found so far being the 36-ton monster that Admiral Peary brought from Greenland in 1897.



This is how the Meteor Crater, in Arizona, looks when seen from the air. This great depression was made by a meteorite that buried itself deep below the surface thousands of years ago. It measures 1500 yards across and is about 600 feet deep. Judging from fragments found, the meteorite is valuable enough to make a search party well worth while.

It is the belief of scientists that a monster meteorite, more in the form of a comet, perhaps, must have struck the earth at Meteor Crater in the ages past and buried itself deep down beneath the surface. The hole made by its striking the earth measures nearly four-fifths of a mile in diameter, 570 feet in depth, with a level bottom of about 300 acres, and a rim 120 to 160 feet above the surrounding plain.

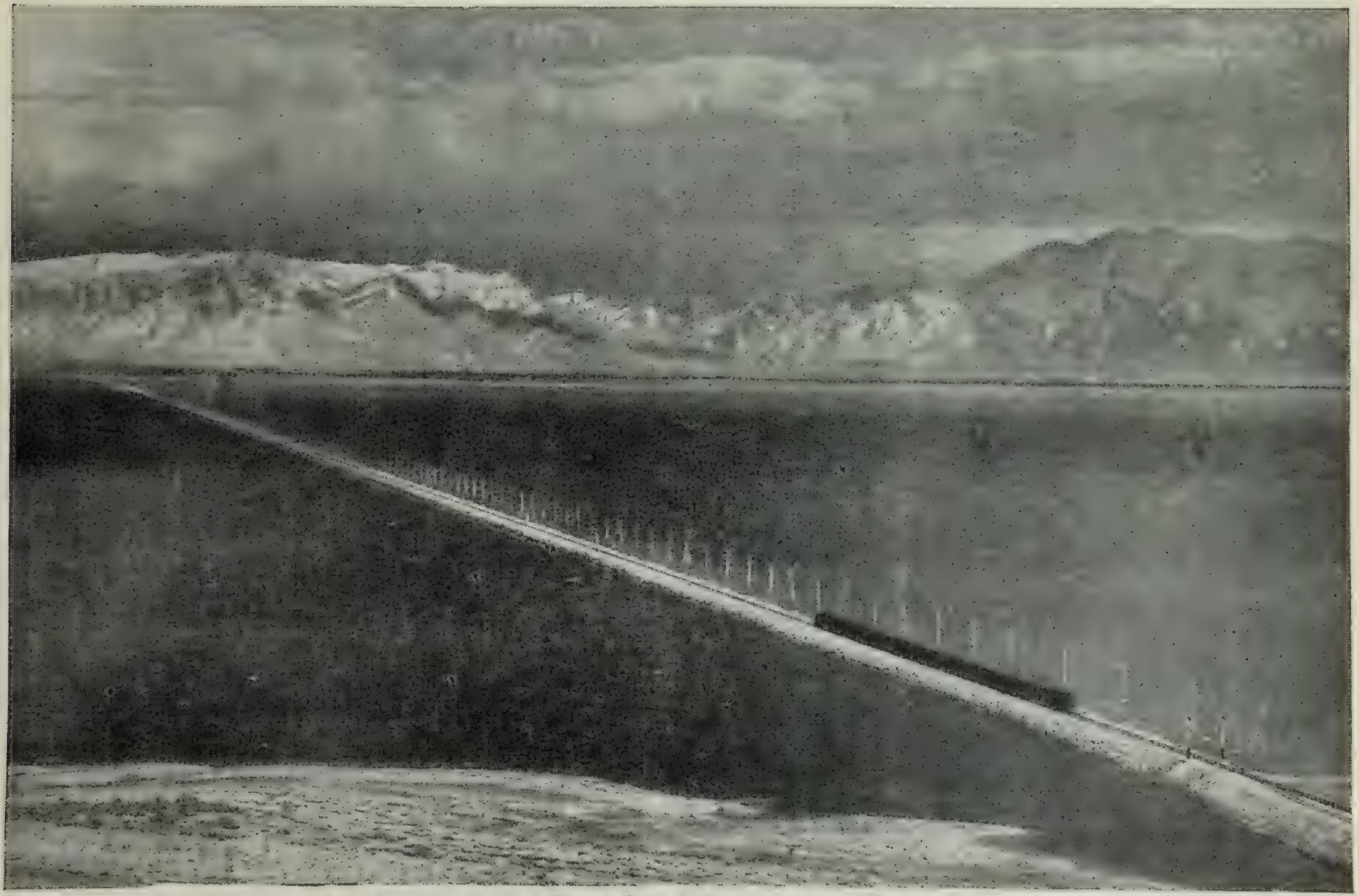
THIS GREAT MASS MUST HAVE WEIGHED OVER A MILLION TONS.

Within a radius of seventy-five miles from this spot something like twenty tons of meteorites, large and small, have been picked up, which have gone a long way to enrich the museums of the world. These are thought to be portions which broke off from the main mass when it collided with the earth. In view of the tremendous hole it tore in the ground and the 200,000,000 tons of rock displaced, it is estimated that the main mass must be at least 300 feet in diameter and weigh over a million tons.

Many pieces of the meteorite have been picked up, and show that this visitor from another world contained nine-tenths of iron as well as some nickel, platinum, iridium and very small diamonds. It should be worth at least £10 a ton, and if it weighs a million tons, that would represent a value of £10,000,000 !

HOW MEN HAVE HUNTED FOR BURIED TREASURE FROM ANOTHER WORLD.

No wonder attempts have been made to recover the body of the meteorite, but so far without success. Hunting for this buried treasure from another world began so far back as 1906, and it has continued off and on up to the present time. It is the belief of geologists who have made a careful study of the crater walls that the mass of the meteorite struck the ground at an angle, burying itself under the south wall of the crater. If this idea turns out to be correct it would cost a great amount of time, labour and money to dig it out. So it would seem that the contents of this meteorite tomb in the Arizonian desert will remain a mystery. The gigantic mass that broke off from a star, comet or other heavenly body seems to be buried for ever in the desert. What a blessing it is that such terrible masses of rock do not fall more often. Smaller portions are constantly falling on land and sea, but very rarely is anyone hurt by these masses.



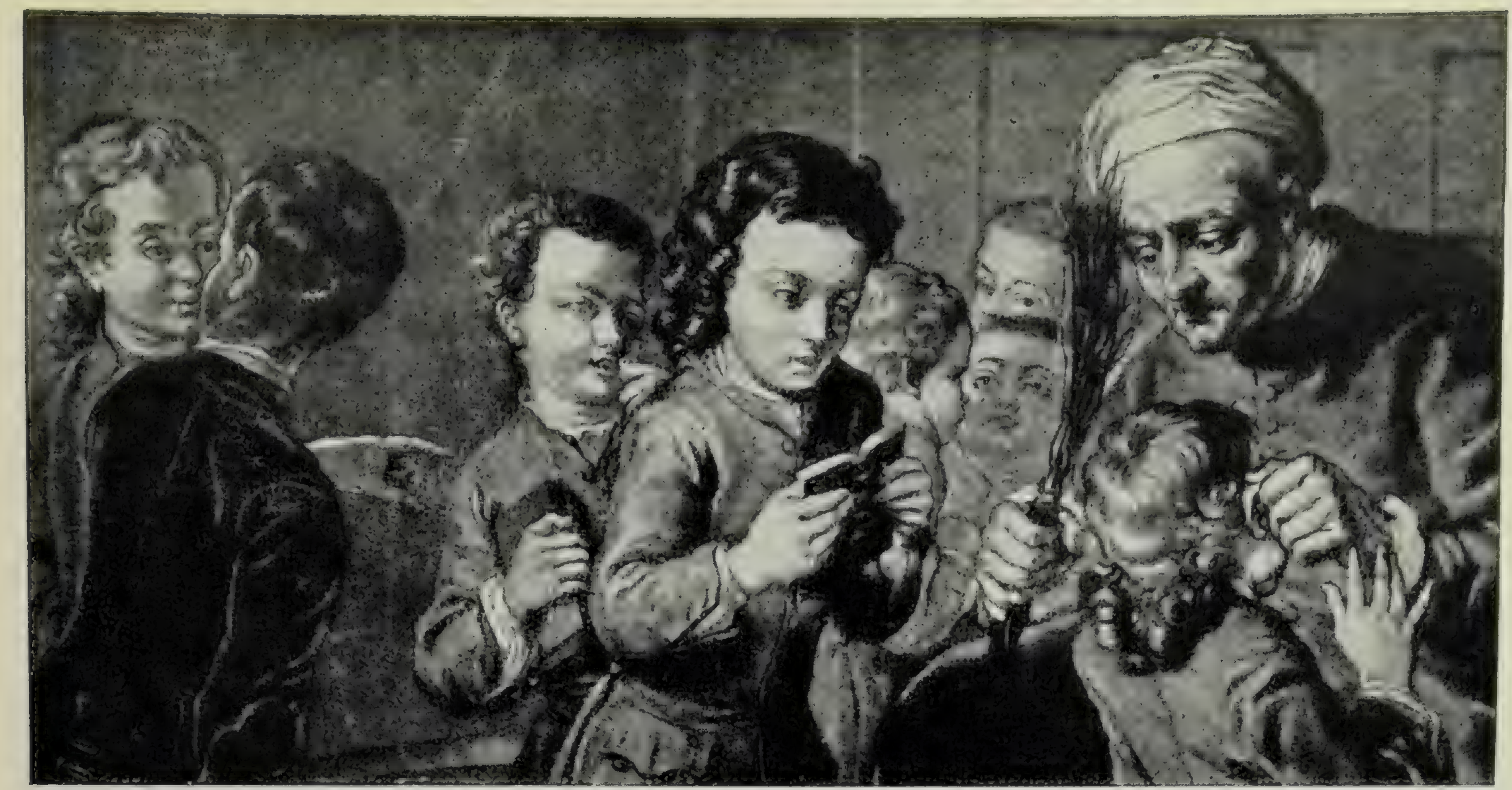
Another wonder to be found in America is the Great Salt Lake, in Utah. Three rivers enter this shallow lake, but as it has no outlet, salts have accumulated and are deposited on the shores in great quantities. It is here that the longest railway crossing in the world is found. You can see in the picture a train making this crossing over the great lake. This opening, which is part embankment and part trestle, is 23 miles in length. Depth of the lake is about 20 ft.

SOME PICTURESQUE ROMAN RUINS

Here is a glimpse of the ruins of the vast Colosseum at Rome. Thousands of people sat here long ago on the stone seats to watch gladiators fighting and to witness wild beast shows which were very popular at that time. It was built mainly by Jewish prisoners captured at the conquest of Jerusalem. Many Christians met their deaths here in olden days.

The arch of Constantine, erected at Rome as a triumphal arch to commemorate the many victories of Constantine the Great. Note the beautiful carving and the figures at the top.

A view of the Forum, Rome, as it appears to-day. In olden days the Romans used to assemble here to listen to the magistrates addressing them from the tribunal.



The old eighteenth century teacher believed in severity and good discipline, as you can see from this amusing picture of an old-time schoolroom. Many great men owe their success to the lesson of self-discipline learnt early in life.

FAMOUS MEN AND WOMEN

Continuing our brief biographies of famous people, we here tell of ancient personages, scientists, thinkers, artists and musicians, travellers and statesmen. A few of each type are chosen, and many portraits are included in the section. In other parts of the book you will find some of these people are mentioned, and these brief biographies will assist you in understanding what you read.

HOW NERO PLAYED HIS LYRE WHILE THE CITY OF ROME BURNED.

Nero, you have probably heard, played his lyre while Rome burned. Whether that is literally true or not is difficult to establish, but it certainly gives the key to his unenviable personality. His is more of a tragedy of vanity and cowardice than cruelty alone.

The son of Agrippina—whom he later had murdered—Nero ruled wisely and meekly for some years, but soon his horrible vanity and wild fear of losing his power urged him on to disgusting bloodshed and persecution. Men were even put to death for yawning during one of his tiresome songs or recitations. Particularly did the Christians suffer, for Nero proclaimed that it was they who had burned Rome. At length the terror reached such a pitch that the people rose against him. Like the coward he really was, Nero stabbed himself to death. (Born 37, died 68.)

THE ALL-CONQUERING MONARCH OF 2000 YEARS AGO.

Alexander the Great packed more into his thirty-three years of life than most men could pack into 300 years. The son of Philip of Macedon, his military genius struck terror into the hearts of his foes. With stunning suddenness his army would strike. And the battle was over before his enemies expected it to begin.

Once, when advised to attack the Persian King at dark, so that his troops would not see the superior number of the Persians, Alexander replied: "I will not steal a victory." His death was the result of a chill caught while swimming. (Born 356 B.C., died 323 B.C.)

FIRST CHRISTIAN ROMAN EMPEROR, WHO STOPPED GLADIATORIAL FIGHTS.

Constantine the Great was the first Christian Emperor of Rome. After his father's death at York, Constantine had to defeat Maximian, his father-in-law, and Maxentius, his brother-in-law, before he could take power. When he had gained his victories, he ordered his soldiers to wear a monogram of the name of Christ on their shields. He abolished the persecution of the Christians, stopped the gladiators' fights in the arena and moved his capital to Byzantium, which he named Constantinople—after himself. He was the first of eleven Roman emperors of the same name. (Born about 288, he died in 337.)

HOW LISZT MADE A RESOLUTION WHICH LED TO HIS FAME.

FRANZ LISZT was the prince of pianists. When only a young student, he heard the great Paganini play his violin. There and then young Liszt made a resolution : to achieve the mastery over the piano that Paganini had over the violin. He succeeded. In every great European city he was received with rapturous applause. Eventually he turned to musical composition and in that sphere also won great renown. Some of the finest musicians of the nineteenth century were among his pupils. He took orders in the Roman Catholic church and is sometimes called the Abbé Liszt. (Born 1811, died 1886.)

THE BOY WHO WAS A FAMOUS COMPOSER WHEN HE WAS FIVE YEARS OLD.

WOLFGANG MOZART, a composer at five years of age, was in his grave thirty years later; but in that short time wrote his name in large letters across the History of Music. Before he was six he had toured Europe, and at fourteen had written and produced an opera. Despite his great success, Mozart never really escaped the shadow of poverty and was buried in a pauper's grave. His superb "Requiem," unfinished on account of his fatal illness, was sung to him by friends as he was dying. (Born 1756, died 1791.)

THE FRENCHMAN WHO WROTE THE POPULAR OPERA, "FAUST."

CHARLES FRANÇOIS GOUNOD, the French composer, is probably best known by the ever-favourite opera, *Faust.* His church music, masses and oratorios are also famous. Born in Paris, he studied music there and later at Rome. Upon the outbreak of the Franco-Prussian War, Gounod remained in London for several years. (Born 1818, died 1893.)

THE MAN WHO WORKED LIKE A SLAVE AND YET WAS ALWAYS POOR.

FRANZ SCHUBERT was a very hard-working composer. In one year he composed five operas, two symphonies, two masses and 146 songs, fifteen of them being written in two days. It is said that, when reading a poem, the music for it would spring to his brain, and he could write it out at once, Schubert's story is a sad one. Despite the excellence of his work he was always poor. With his exquisite "Unfinished Symphony" incomplete, he died at the age of thirty-one and was buried close to Beethoven, whom he admired so much. (Born 1797, died 1828.)

HOW CHOPIN, IN SPITE OF HIS ILLNESS, COMPOSED BEAUTIFUL MUSIC.

FREDERIC CHOPIN, a master of waltzes and graceful, dainty music, was born at Warsaw. He first appeared before the public at the early age of nine. By the age of nineteen he had appeared at several Berlin concerts and began a tour of Europe. Though of a quiet disposition and suffering from the terrible disease of consumption, Chopin worked until the very end. (Born 1810, died 1849.)

THE CHILD-WONDER WHO WAS A MASTER OF MUSIC AT THE AGE OF ELEVEN.

MENDELSSOHN'S philosophy—"What's worth doing at all is worth doing well"—was expressed in his music. He was a child prodigy, astonishing the musical world at the age of eleven. As his father was rich, he had every opportunity to cultivate the talents that have made him famous. Before twenty he had written the overture to *A Midsummer Night's Dream,* and a year later visited London and made a triumphant tour of Europe. (Born 1809, died 1847.)

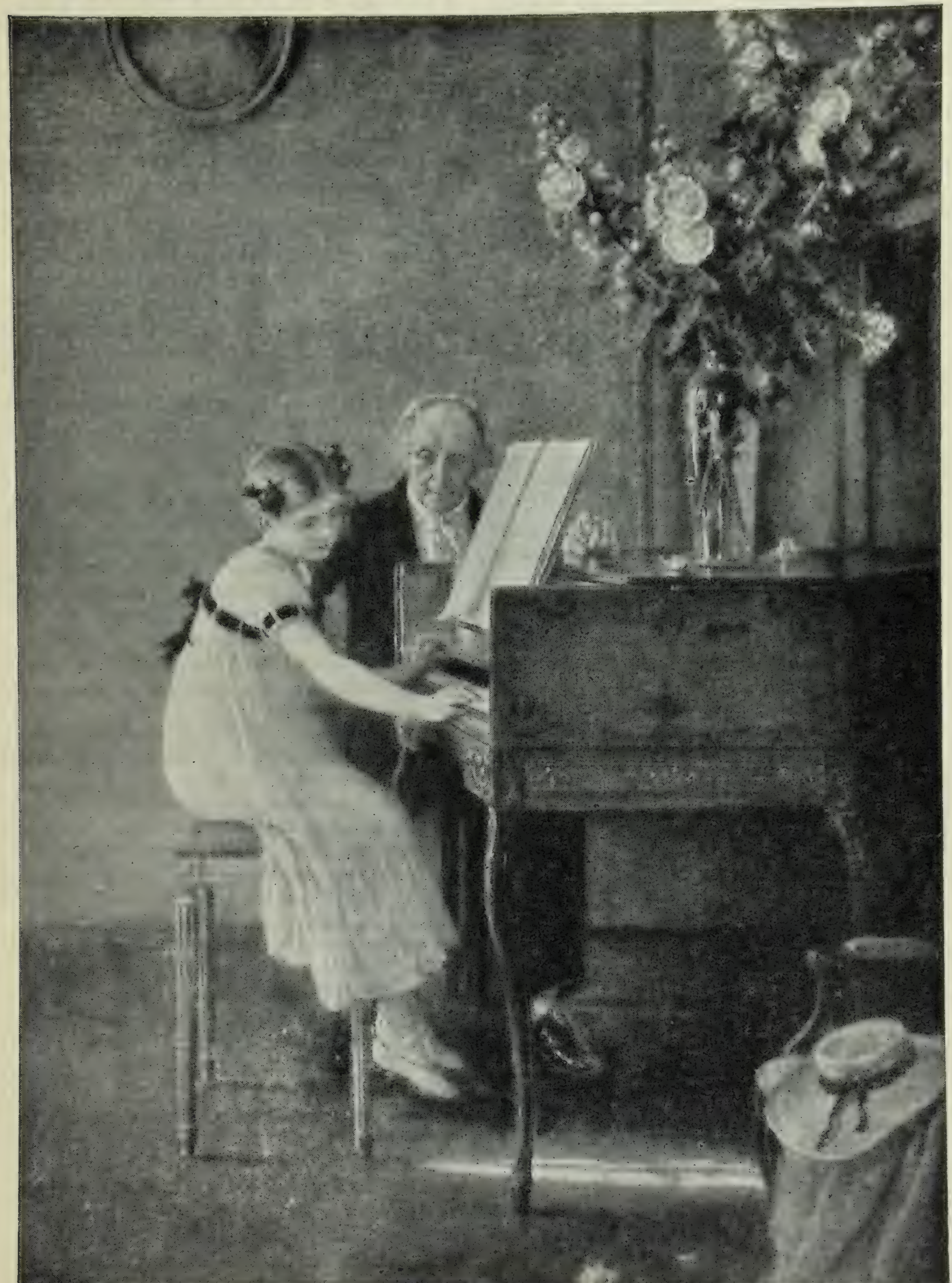
HOW A WRITER AND COMPOSER WAS BANISHED BECAUSE OF HIS POLITICAL VIEWS.

RICHARD WAGNER was the thunderbolt of the nineteenth century musical world. Born at Leipsic, his early interests were in the realm of literature rather than music. His life was full of conflict and he had many struggles before he finally reached success. For his political views he was banished from Dresden ; *Tannhauser,* now regarded as one of his greatest works, was hissed when it was first produced in Paris ; critics and public alike poured scorn on his conception of music. To-day his operas are acclaimed as masterpieces. (Born 1813, died 1883.)

THE MAN WHO WROTE THE CHEERY MUSIC OF OUR FAVOURITE OPERAS.

SIR ARTHUR SULLIVAN is best known for the delightful music he wrote for the Savoy Operas, better known as the works of Gilbert and Sullivan. Few people have not been charmed with the airs of the *Mikado, H.M.S. Pinafore, Yeoman of the Guard, Gondoliers* and so on. Yet despite his genius for these more popular melodies, his ability for oratorios (that is, sacred works of song for soloists and choruses) and other solemn works was almost equally remarkable. Born in London, his career was a blaze of success. As a boy, he was a chorister, and later studied music in Leipsic. He was knighted in 1883. (Born 1842, died 1900.)

A LITTLE MAID AND HER MUSIC LESSON



In this delightfully restful painting the artist, Constantin Meunier, has given us a glimpse of the joy to be found in music. The young pupil is lost in rapture at the delicate treble trills her right hand is making, while the old master watches her progress with deep satisfaction—and a critical eye. Meunier was also famed for his sculptures.

HOW THE SIGHT OF A THIEF CLIMBING OVER A WALL INSPIRED GAINSBOROUGH.

Thomas Gainsborough, the famous English painter, discovered his talent in an unusually useful way. As a boy he was fond of strolling down country lanes and making sketches of what he saw. One day he caught sight of a thief climbing over his father's wall. His accurate memory and nimble fingers made such a good drawing of the intruder that the man was subsequently recognised and brought to book.

Born at Sudbury, Gainsborough went to London to study art in 1741, and after his marriage to a Miss Burr, moved to Bath, then probably the most fashionable spa in Britain. Here he built up an enviable reputation by his brilliant portraits of society ladies.

On his return to London he was commissioned to do several paintings of the Royal Family. One of his most celebrated paintings is of the distinguished actress, Mrs. Siddons. Among his landscape works the best-known are "The Market Cart" and "The Watering Place." (Born 1727, died 1788.)

THE MAN WHO LASHED HIMSELF TO A SHIP'S MAST FOR THE SAKE OF HIS ART.

Joseph Mallord W. Turner, Britain's most celebrated landscape painter, had his first picture in the academy when he was only fifteen. Before painting one of his masterpieces, "The Snowstorm," he lashed himself to a ship's mast so that he could obtain the best view-point of the real thing!

Son of a Covent Garden barber, young Turner's talent was early noticed. When he first left school he studied under Sir Joshua Reynolds, by whose side he now lies buried in the crypt of St. Paul's Cathedral.

Turner could paint the sky and the effects of cloud and sun as no other artist ever painted them. It has been said that he "put sunlight on canvas." He sometimes achieved this by laying thick lumps of solid paint on his picture. Among his best known works—distinctive for their exquisite colouring—are "The Fighting Téméraire," "Dido Building Carthage," and "Childe Harold's Pilgrimage." (Born 1775, died 1851.)

HOW AN ACCIDENT WAS THE CAUSE OF VAN DYCK'S RISE TO FAME.

Anton Van Dyck's first step to fame arose through an accident. Rubens, the celebrated Dutch artist, examining part of one of his works, discovered that some of it had been painted by some one else. Inquiry revealed that during Rubens' absence one of the pupils had accidentally smeared the canvas and had asked Van Dyck to try to repair the smudge!

At the age of twenty-two, Van Dyck was widely known in his own country. Declining an invitation from James I. to remain at the English Court, he studied Italian masters at Venice, Genoa and Rome before returning to Holland.

He was knighted by Charles I. of England, who made him the Court Painter in 1632. Many of his portraits—including several of the Royal Family—are in English galleries. His tomb in St. Paul's Cathedral was destroyed in the Fire of London, in 1666. (Born 1599, died 1641.)

THE FAMOUS PAINTER WHO DELIGHTED IN THE FUN OF THE FAIR.

William Hogarth, a painter of the eighteenth century, received many of his ideas from a fair-ground. He spent his childhood near St. Bartholomew's Church, London, not far from where the famous fair was held. It is believed that the observant William obtained some of his inspiration from the crowds which flocked to the fair.

Hogarth's works nearly always ridicule the life he saw around him. (Born 1697, died 1764.)

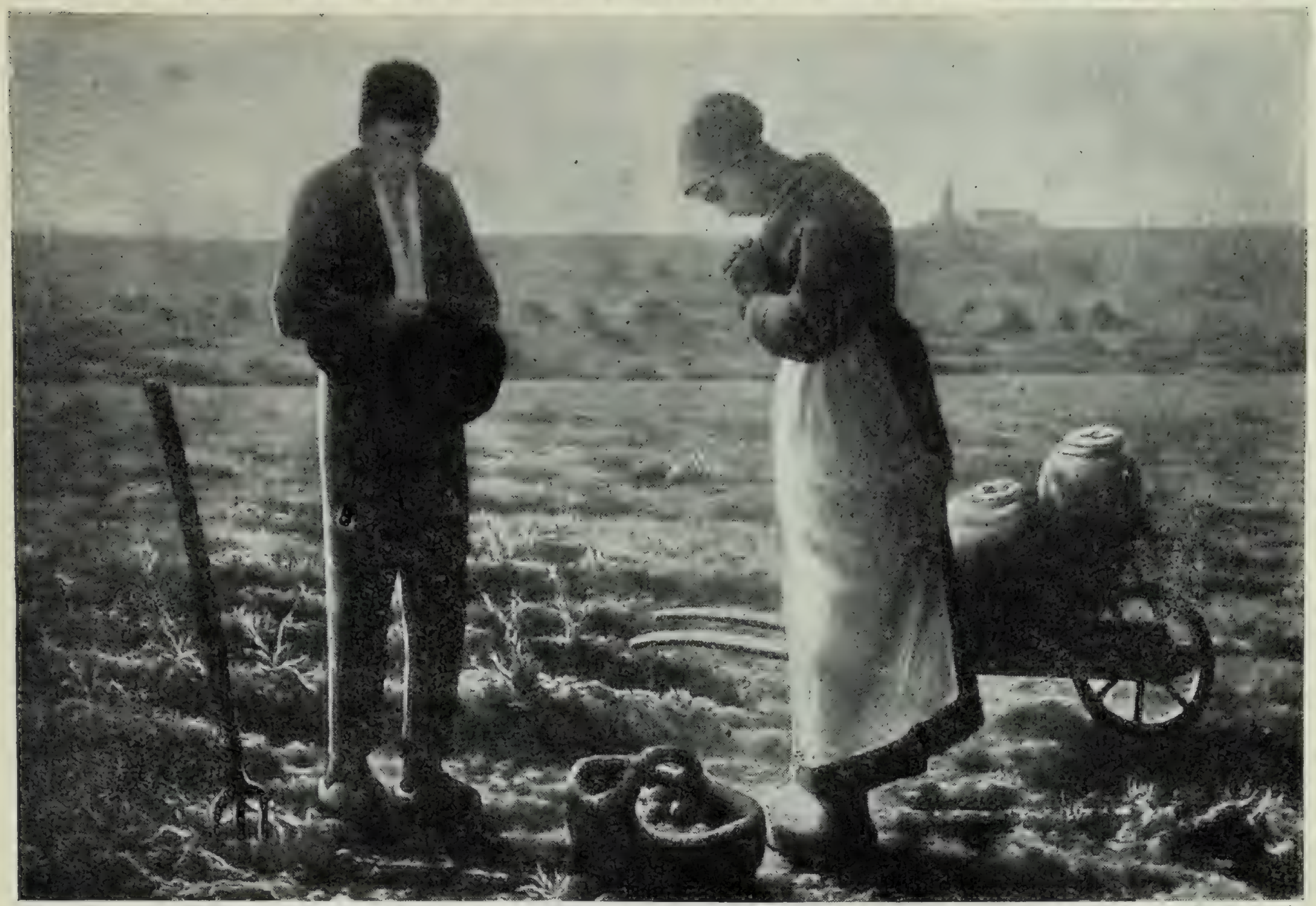
HOW A MILLER'S SON ROSE TO BE A WORLD-FAMOUS ARTIST.

Rembrandt Van Rijn was the fifth child of a Leyden miller. Though originally intended for law, he rose to be one of the world's most distinguished artists. Largely through the influence of his mother, he knew the Bible word for word and consequently most of his pictures have a religious significance. His most celebrated painting is "Christ Blessing the Little Children," now occupying a commanding position in the National Gallery, which contains fourteen of his works. Rembrandt was very absent-minded. It is said that a friend once found him at work in the open air, while a heavy bombardment was raging around him. (Born 1606, died 1669.)

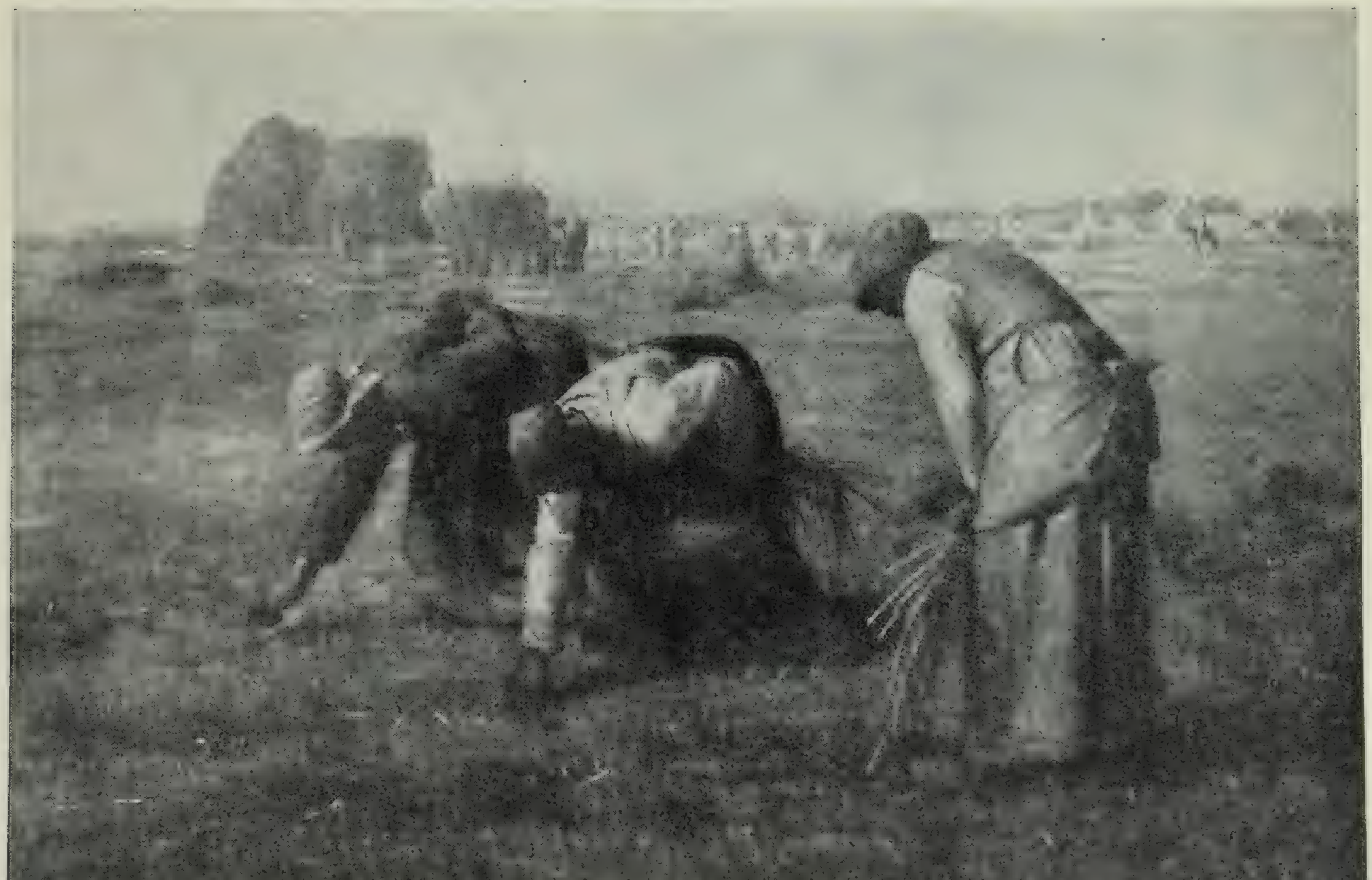
THE BOY WHO WAS BORN WITH PAINTING IN HIS BLOOD.

Raphael Santi was an artist born and bred. He was the son of a clever painter who gave him the benefit of his experience until his teaching passed into higher hands at Florence. After his training, Raphael's astonishing talent put him at the head of a school of painters at Rome. It was unfortunate for the world of art that his life was cut short

SIMPLE RUSTIC DIGNITY IN PAINTING

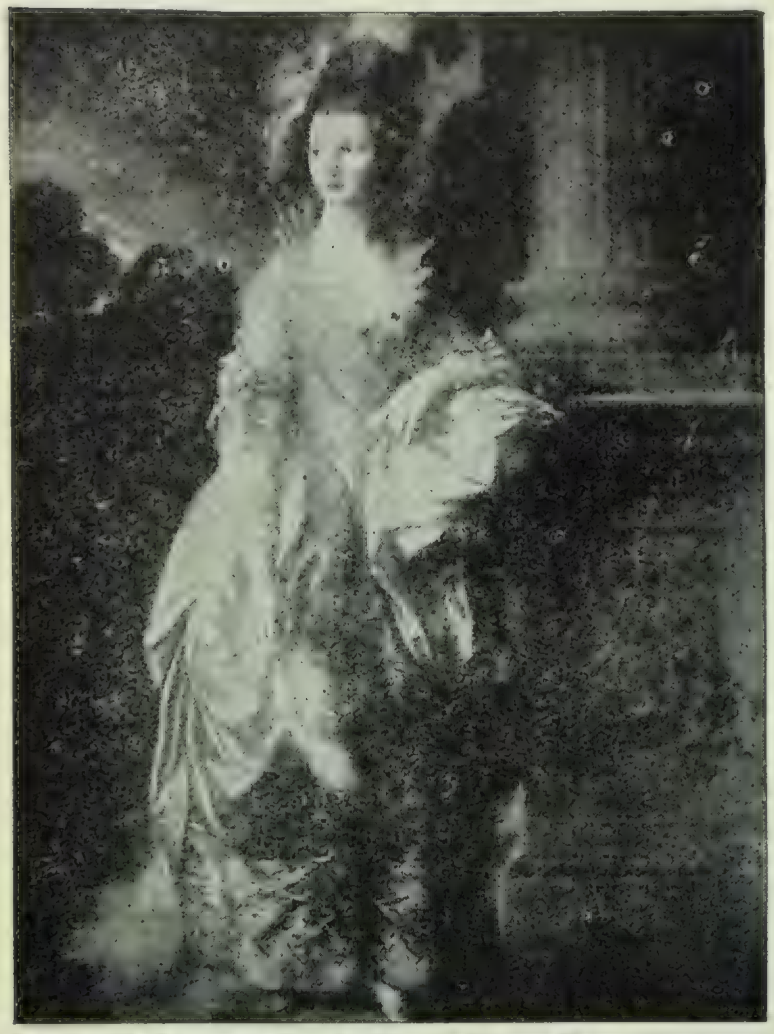


Jean François Millet, who painted the two beautiful country pictures shown on this page, was born, the son of a French peasant, in 1814. He loved as a child to study the engravings in an old Bible, and this gave him the desire to draw and paint. He practised hard and long, but poverty kept him on the land.

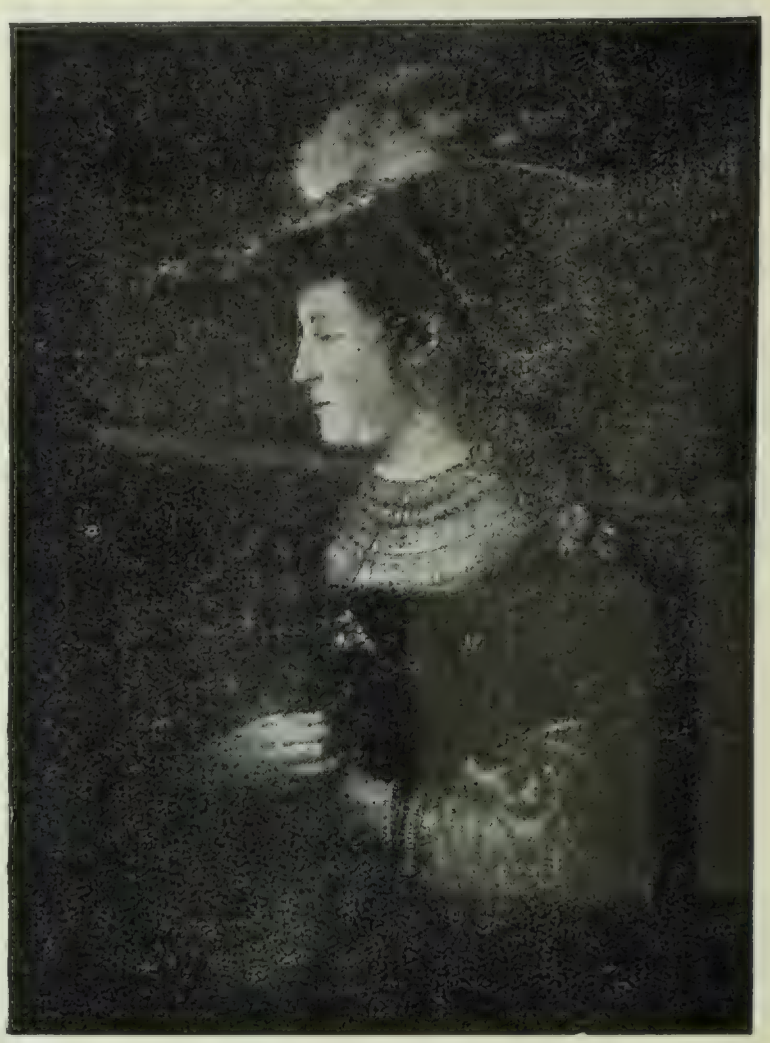


At long last he went to study under other artists, but in the end left the studios to work out his own ideas. His hard life is reflected in such pictures as *The Angelus* and *The Gleaners* shown above. There is poetry and sadness in the figures of these tired, hard-working country folks.

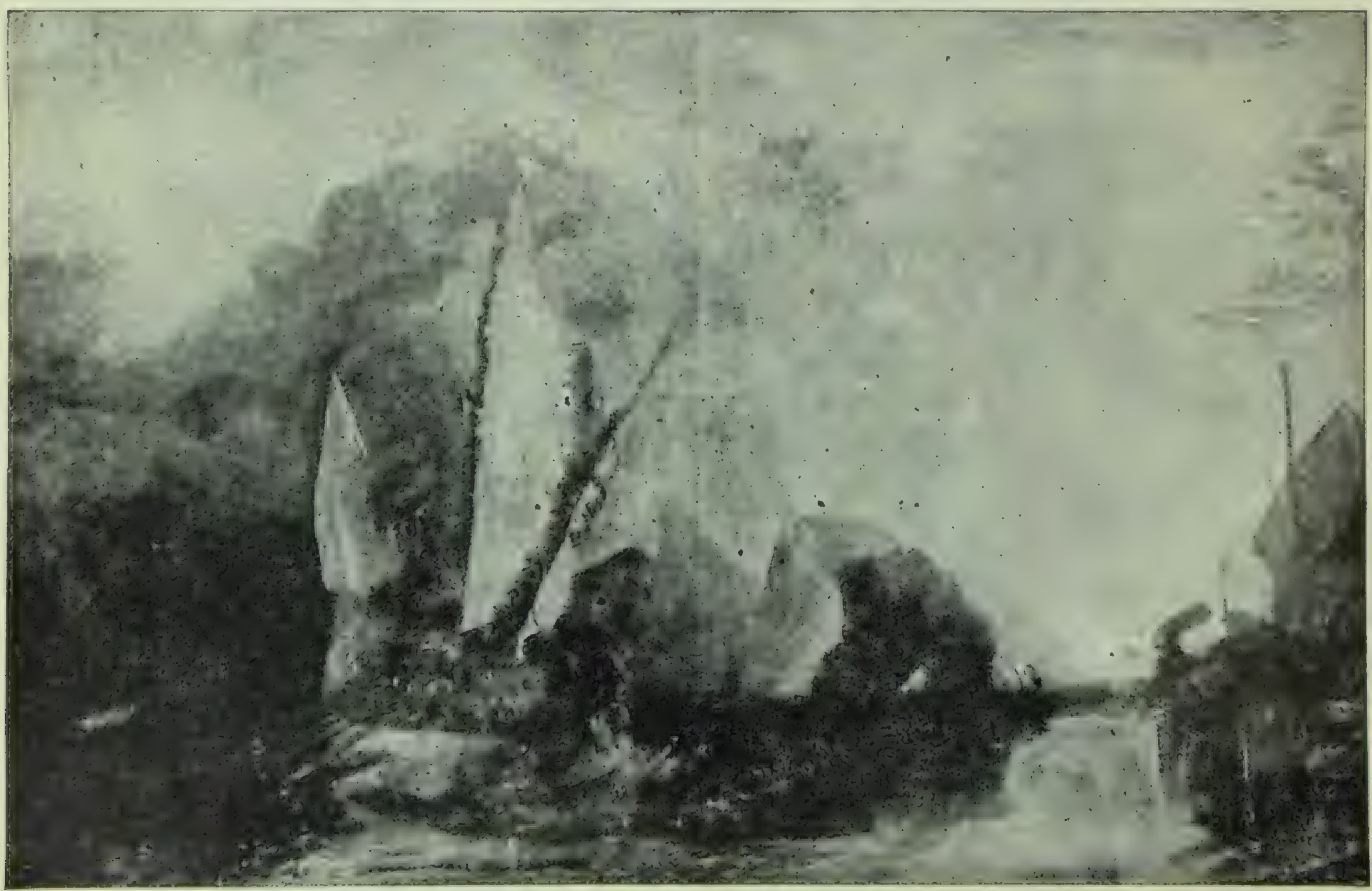
GEMS FROM THE HANDS OF SKILFUL ARTISTS



A dignified portrait of the "Hon. Mrs. Graham," delicately yet firmly painted by Thomas Gainsborough. Gainsborough was also skilled in landscape painting.



Rembrandt's paintings are generally darker than those of later artists, such as Gainsborough and Reynolds. The above picture shows Saskia, the artist's wife.

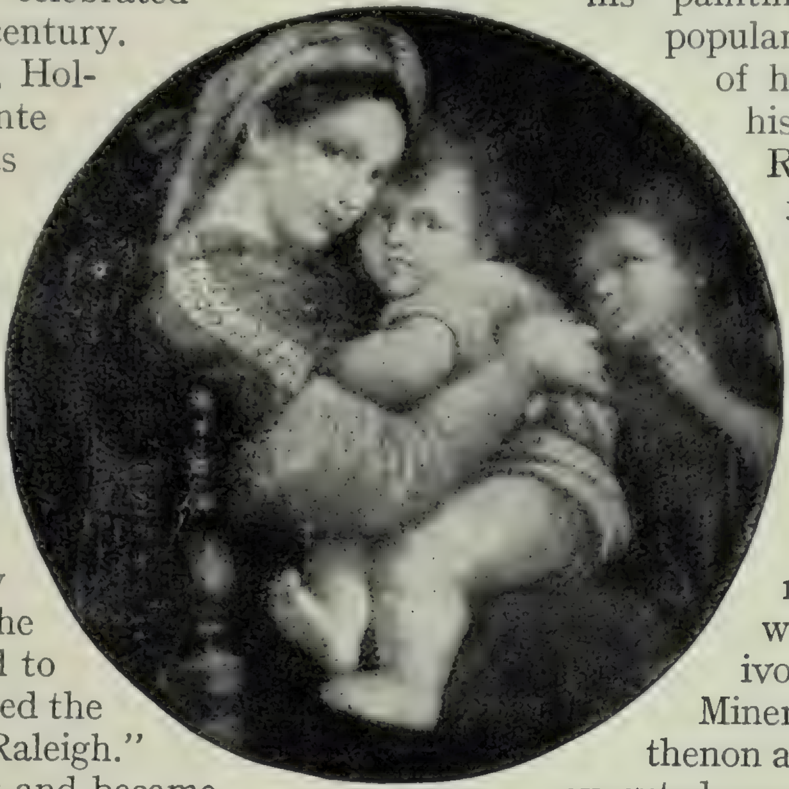


Turner, who had the power of putting sunlight on canvas, here gives a picture showing an incident during the journeyings of Ulysses. Critics say that it is impossible for any artist to paint a more magificent piece of colour work than this.

at the early age of thirty-seven. One of his most famous pictures, "Madonna and Child with St. John," was bought for the National Gallery 300 years after Raphael's death for £9000! (Born 1483, died 1520.)

THE ARTIST WHO GAVE US THE PAINTING, "THE BOYHOOD OF RALEIGH."

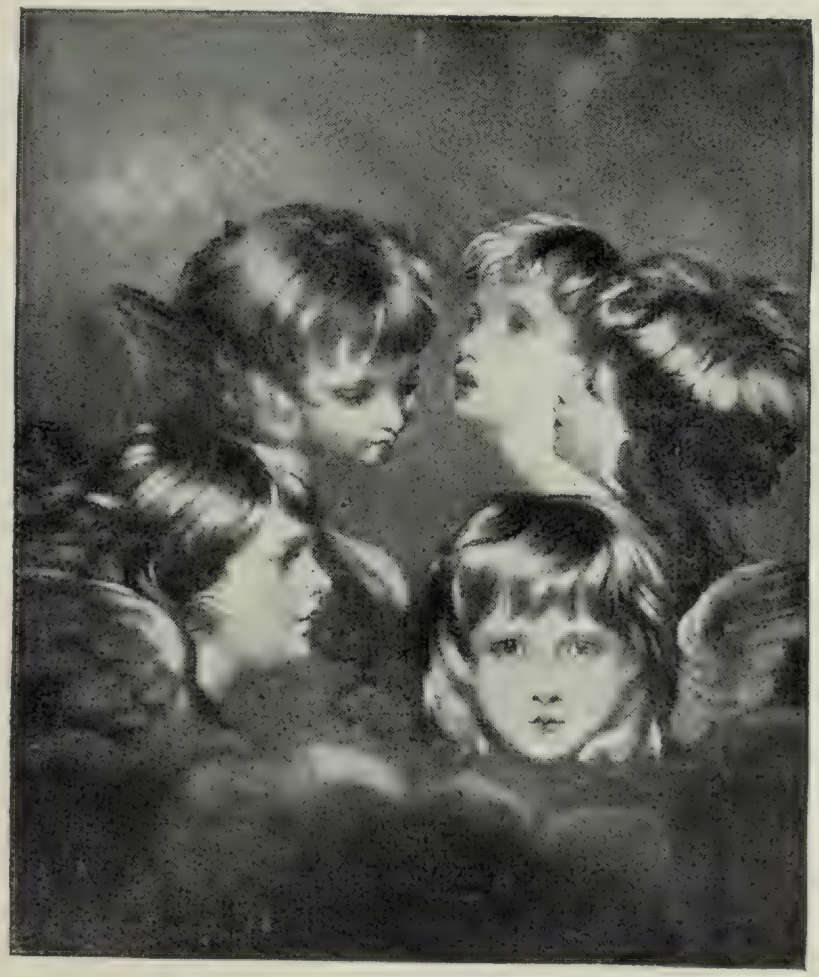
SIR JOHN E. MILLAIS, born at Southampton, was one of the most celebrated painters of the last century. Along with his friends, Holman Hunt and Dante Gabriel Rossetti, he was behind the pre-Raphaelite movement—a school of painting which urged the re-introduction of the style of the old Italian masters who came before Raphael and of whom you will read later in this book. His early painting, "Christ in the Carpenter's Shop," is said to be his best. He also painted the famous "Boyhood of Raleigh." He was created a baronet and became president of the Royal Academy in 1896. (Born 1829, died 1896.)



This beautiful picture of Jesus with his mother and St. John is by Raphael. It is sometimes called "The Madonna of the Chair."

THE VAIN SCULPTOR OF FOURTEENTH CENTURY ITALY.

BENVENUTO CELLINI was a talented Italian sculptor, whose beautiful craftsmanship won him the favour of influential people. He was very quick-tempered, and it has been said that had he not been as skilled with his dagger as with his tools he would never have reached a ripe old age. Among his finest works are "Leda and the Swan," "Atlas Supporting the World," and "Perseus with the Head of Medusa." He wrote the story of his life. (Born 1500, died 1571.)



Sir Joshua Reynolds was a genius at arranging the positions of those whose portraits he painted. Here he shows five views of the same child's head, and thus produces a delightful study of cherubs.

THE PORTRAIT PAINTER WHO BEGAN HIS SKETCHING IN SCHOOL.

SIR JOSHUA REYNOLDS, the celebrated painter, used to sketch his schoolmaster and class chums on the form-room wall. Undeterred by punishment, he persevered, studying first under an English tutor and later at Rome. Shortly after his return to Britain his painting became immensely popular. Many notable people of his age used to meet at his Leicester Square studio. Reynolds, who was the first president of the Royal Academy, did some of his finest work when he was over sixty. (Born 1723, died 1792.)

PHEIDIAS was the greatest of all Greek sculptors. The most renowned of all his works was the gigantic ivory and gold statue of Minerva housed in the Parthenon at Athens, where he also executed part of the famous frieze, some of which is still preserved in the British Museum. Plutarch, the historian, says that the last days of Pheidias were spent in prison. (Born 500 B.C., died 432 B.C.)

HOW TOBACCO WAS BROUGHT TO ENGLAND.

SIR WALTER RALEIGH, among a host of other achievements, laid the seeds of the modern tobacco factory. As a boy he used to go down to the seashore and hear the stirring stories of the seamen about the undeveloped riches of the New World, as a famous picture, "The Boyhood of Raleigh," shows us. It was largely their tales that later inspired him to sail out to

Virginia and South America in the hope of founding colonies there. It is said that when his servant first saw him smoking Virginian tobacco he imagined his master was on fire and threw a bucket of water over him. Besides being a great Elizabethan admiral, Raleigh was also a gallant poet and writer and a great favourite of the Queen's. Upon the death of Queen Elizabeth, his fortunes changed and he fell into the hands of jealous enemies who eventually had him beheaded. (Born 1552, died 1618.)

HOW A BRAVE EXPLORER REACHED THE SOUTH POLE.

CAPTAIN ROALD AMUNDSEN, the Norwegian explorer, was the first man to reach the South Pole. In 1898 he accompanied Captain Adrien de Gerlache on a Polar Expedition, but their ship was ice-bound for more than a year. Shortly after his return to Europe Amundsen set out once more, determined to penetrate to the North Pole. For three years his ship ploughed the ice-bound seas of the north, eventually succeeding in passing from the Atlantic to the Pacific by the North-West Passage, a task explorers had tried for centuries. In 1910 Amundsen began his race with Captain Scott to the South Pole. He won. On December 16, 1911, the flag of Norway was flying on the white plateau of the South Pole. (Born 1872, died 1928.)

9
1856
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This is the map which David Livingstone drew up to show the conditions of the Dark Continent which he explored so daringly.

HOW A POOR SCOTTISH BOY EXPLORED THE DARK CONTINENT.

DAVID LIVINGSTONE, doctor, missionary and explorer, stands like a colossus over the dark mysteries of Central Africa. A poor boy working in a Scottish cotton mill, he studied early and late to qualify as a missionary and a doctor. In 1841 he joined Robert Moffat, the African explorer—whose daughter, Mary, he eventually married—and spent several years in missionary work. Compelled to move from Transvaal, he travelled northwards and was the first white man to set eyes on Lake Ngami.

In 1851 he decided to send his wife and children back to England and to continue his explorations alone. "I shall open up a path to the interior or perish," he said. In 1853 he set out to cross the Dark Continent from East to West—a feat never before attempted by a white man! In his four years' journey he made so many wonderful discoveries that he returned to Britain a famous man.

But the call of Africa was in his bones. In 1858 he set out again on another expedition. The next time he returned home he had left his wife dead in Shupanga. It was a great blow.

Yet once more Livingstone went out. This time there was no coming back. Weakened by repeated illnesses and worn out by work, he died in prayer by his bedside at Ilala. (Born 1813, died 1873.)

THE MAN WHO MET LIVINGSTONE IN THE HEART OF AFRICA.

SIR HENRY MORTON STANLEY, the famous African explorer, was born in a humble North Wales cottage, brought up in a workhouse, became deck-hand, clerk, soldier, American naval officer and journalist. In 1871 he was sent by the *New York Herald* to find David Livingstone, the missionary-doctor-explorer. Most people have heard of their historic meeting in the heart of dark Africa. Returning to continue Livingstone's work, Stanley solved the riddle of the Congo in 1876, and did much to discover Africa's secrets. (Born 1841, died 1904.)

THE MAN WHO PUT HIS BRILLIANT THOUGHTS ON PAPER FOR US TO READ.

FRANCIS BACON, Viscount St. Albans, was a brilliant writer and thinker of Queen Elizabeth's day. *Bacon's Essays* are one of the world's classics, for they contain deep truths cleverly expressed. Bacon was a philosopher in search of truth and knowledge, and his writings show him to have been far ahead of his time. As Lord Chancellor of England he was accused of taking bribes, degraded, but later pardoned. His death came through a chill contracted after stuffing a fowl with snow as a scientific experiment. Some people say he wrote the plays we call Shakespeare's. (Born 1561, died 1626.)

THE CRAFTY IRON CHANCELLOR WHO BUILT UP THE GERMAN NATION.

PRINCE OTTO EDUARD LEOPOLD VON BISMARCK had another name: The Iron Chancellor. It expressed his character. For he was a man with a purpose and had the determination to achieve it. He grew from a dashing young military student, whose prowess in duels and amazing capacity for drink made people call him "Mad Bismarck," to be Prussia's greatest statesman and the real founder of modern Germany. In 1862 he became chief minister to King William I. By a series of cunningly planned and well-organised wars he added both territory and prestige to his native country, assembled her under one emperor and launched her as a world power. More clearly than most people know, can the finger of Bismarck be detected behind the deeper events that led to the Great War. (Born 1815, died 1898.)

HOW DISRAELI WAS JEERED AT WHEN HE MADE HIS FIRST SPEECH.

LORD BEACONSFIELD will always be better remembered by his birth-name of Benjamin Disraeli. The son of a London Jewish author, he rose to be one of Britain's most picturesque Prime Ministers.

His chief interests in life were politics and literature. Indeed, his early novels, *Coningsby*, *Sybil*, and *Tancred*, cleverly outline the ideas of the Young England Party which he led shortly after his election as Member of Parliament for Maidstone in 1837. Strangely enough, his first speech in the House of Commons was greeted with indifference and even amusement. Angrily he turned on his listeners. "The time will come when you will hear me," he exclaimed. It was a true prophecy. After three times being Chancellor of the Exchequer in governments headed by Lord Derby, he became Prime Minister in 1868 and again in 1874. Two years later he was made the Earl of Beaconsfield, and elevated to the House of Lords. His greatest service to England was tinged with drama. Acting on his own authority, he spent £4,000,000 in purchasing the Khedive of Egypt's shares in the Suez Canal, and thus secured power and wealth for Britain. (Born 1804, died 1881.)

Prussia's greatest statesman, Otto von Bismarck, or "Mad Bismarck," as the people called him. He was a fierce and daring fighter and organised many wars.

THE MAN WHO HELPED THE SLAVES TO GAIN THEIR FREEDOM.

WILLIAM WILBERFORCE was the slaves' friend. At an early age, he realised the sin and injustice of forcibly tearing the unfortunate negroes from their homes and selling them—like meat or clothing—to employers in other lands.

The son of a wealthy Hull merchant, Wilberforce entered Parliament almost as soon as he had left the university. Soon his eloquent denunciation of slavery had brought him into prominence and in 1807 he had the satisfaction of seeing a law passed which forbade this scandalous trafficking in human goods. The tragedy of his life was that he died a month before his great ambition was crowned with success. For in August, 1833, a bill was passed which ordered the freedom of all slaves in the British Dominions. (Born 1759, died 1833.)

THE MAN WHO BELIEVED IN "LETTING SLEEPING DOGS LIE."

SIR ROBERT WALPOLE is best known by his philosophy of "Let sleeping dogs lie," a phrase which partly—though by no means completely—reflects his political outlook. After a thorough education at Eton and Cambridge,

Lord Beaconsfield, better known as Benjamin Disraeli, the brilliant statesman and writer, who worked hard as Prime Minister to gain power and wealth for England.

he was a Member of Parliament at twenty-five, and a minister before he was thirty. For the greater part of George I.'s reign he was Prime Minister, and also held the reins during the time George II. was on the throne. A great peace minister and a clever financier, one of his most important works was that of helping his country out of the disaster caused by the South Sea Bubble. (Born 1676, died 1745.)

HOW A FAMOUS FRENCHMAN BECAME A BISHOP AT THE AGE OF TWENTY-TWO.

CARDINAL RICHELIEU was the crafty French minister who paved the way for the glorious reign of Louis XIV. His feeble health prevented his carrying out his original intention of a military career. Instead he studied for the Church, and was appointed a bishop at the astonishingly low age of twenty-two. Very soon he was within the royal circle and captured the confidence of Louis XIII. to such an extent that he was very quickly made Prime Minister, and became the real ruler of the country.

His aim was to construct a strong central government in France, and to make her supreme in Europe. By cunningly pitting one country against another he smashed the power of Spain and humbled Austria. At home he was particularly severe against the Calvinists and ruthless in his determination to deprive the nobles of their influence and power. He was interested in literature and formed the French Academy in 1635. (Born 1585, died 1642.)

WHO SAID THESE FAMOUS WORDS: "I CANNOT TELL A LIE"?

GEORGE WASHINGTON is America's greatest national hero. Every one knows his renowned childhood statement: "I cannot tell a lie." Born in Virginia from English parents, Washington lost his father at an early age, and had to fight out the battles of life for himself. He gained his knowledge by self-education, a fact which probably accounts for his great human sympathy and respect for practical matters. The story of his courageous generalship and heroism makes thrilling reading. In 1789 he became first President of the United States and was re-elected four years later. In the last month of the eighteenth century he died with the words, "It is well" on his lips. Since then he has remained first in the hearts of his countrymen. (Born 1732, died 1799.)

"BOBBY" PEEL ORGANISES THE FIRST POLICE FORCE IN BRITAIN.

SIR ROBERT PEEL was the man who gave Britain her first organised police force, and —as he was popularly known as Bobby Peel— the officers in blue got the nickname "Bobbies" or "Peelers," the first of which has stuck to them ever since.

Besides being a great social reformer, Peel was a distinguished statesman whose establishment of Free Trade was one of the landmarks of nineteenth century British history. The son of a rich Lancashire cotton manufacturer, young Bobby was intended for a political career from the outset, and his rare ability as a speaker assisted his progress. To understand Robert Peel's place in history one must have a knowledge of English events at a very complicated period. A strange fact is that his political influence reached its high-water mark after he had officially retired from public life. His death was the result of a fall from a favourite horse while riding up Constitution Hill. (Born 1788, died 1850.)

WHAT IS A "JINGO" AND WHO WAS KNOWN AS "PAM"?

LORD PALMERSTON—familiarly known as "Pam"—was undoubtedly one of Britain's most popular nineteenth century statesmen. He is often described as a "Jingo"—which means a rather hasty and warlike type of patriot—but most reliable historians estimate him as a man who sincerely loved Britain and wished to do the best for her.

Educated at Harrow and Cambridge, he entered the political arena as soon as he had left the university. When only twenty-three, he became Lord of the Admiralty, and two years later the Secretary of State for War. It was during his several years' stay at the War Office that he built up his detailed knowledge of foreign affairs which so coloured his career in later years. Often tempestuous in his methods, Palmerston was a tireless champion of British prestige and honour abroad. Despite his long political activity, he was Prime Minister on only two occasions. Yet he had made a renowned name for himself as an energetic pilot of the British ship of state. (Born 1784, died 1865.)

HOW A BRILLIANT POLITICIAN EXPERIENCED DEFEAT AT THE END OF HIS CAREER.

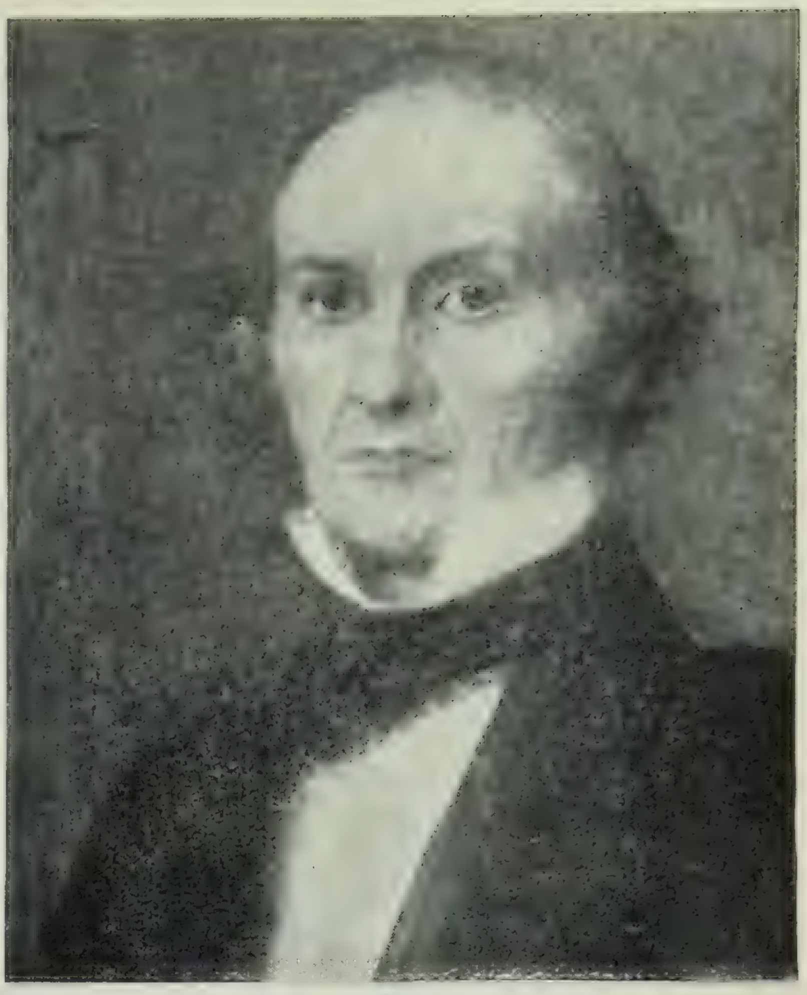
WILLIAM EWART GLADSTONE was perhaps the greatest Parliamentarian in the history of England. The son of a Liverpool merchant, he was educated at Eton and Oxford. He became an M.P. in 1832, and from that moment his rise to political eminence came in rapid strides. As leader of the Liberals he was four times Prime Minister. He was a deep scholar, an able political writer and a magnificent orator. The most amazing demonstration of his influence was in 1879, when his emergence from retirement and brilliant Midlothian election campaign resulted in a sweeping Liberal victory at the polls. It was on the thorny question of Home Rule for Ireland that Gladstone was finally defeated. Four years after his resignation in 1894 he died, and was honoured with a state funeral. (Born 1809, died 1898.)

THE CRAFTY FRENCHMAN WHO WAS BANISHED FROM HIS COUNTRY.

JULES MAZARIN was the wily French minister who succeeded the equally wily Cardinal Richelieu. He loved political intrigue and, though once banished, returned to France and guarded her interests with craft and skill. (Born 1602, died 1661.)

THE MAN WHO FOUGHT FOR SEVEN YEARS TO PROVE HIS HONESTY.

WARREN HASTINGS, the first Governor-General of India, was involved in a trial which lasted seven years. Leaving England in the service of the East India Company, his diligence and ability quickly won him heavy responsibility. By 1771 he was President of the Supreme Council of Bengal and busily engaged with the affairs of his company. Meanwhile, enemies at home were organising serious charges about his rule and his honesty. After one of the longest trials in history he was acquitted, but faced with a costs bill of £75,000. (Born 1732, died 1818.)



Gladstone is one of the outstanding figures in the history of Parliament. As Liberal leader, he was four times Prime Minister. He was a great scholar and orator.

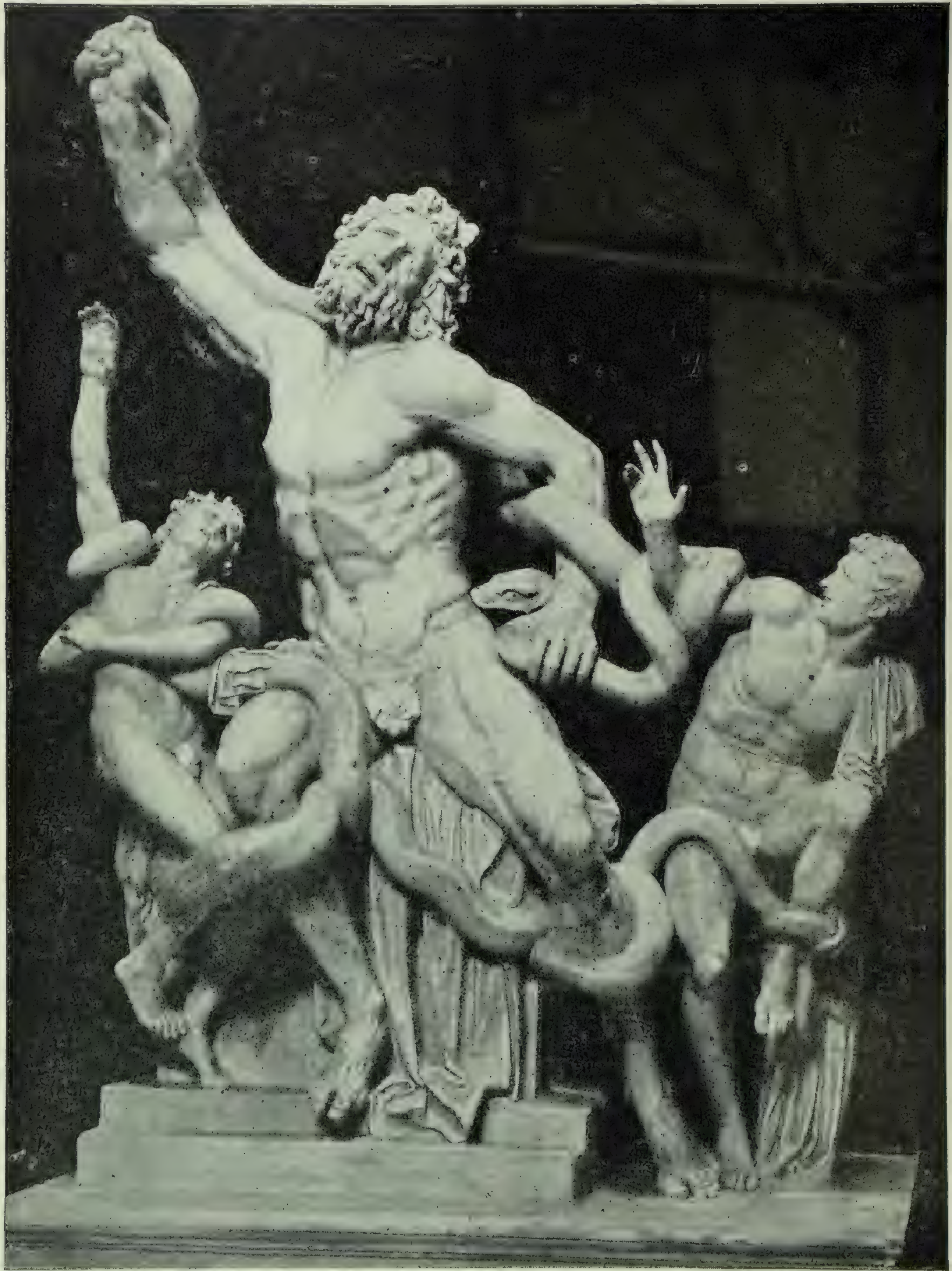
THE BEAUTIFUL QUEEN WHOM EVERYBODY HATED.

MARIE ANTOINETTE, the beautiful spendthrift queen of France! Her story is a sad one. The daughter of Maria Theresa and Francis I. of Austria, she was married at an early age to the Dauphin of France, who later became the fated Louis XVI. But the French people never loved her. Yet when one considers her ill-concealed contempt for any but the nobility, her amazing extravagance and appetite for luxury, her semi-tragic influence over the policy of her husband-king —it is only to be expected that she should receive little respect from her subjects.

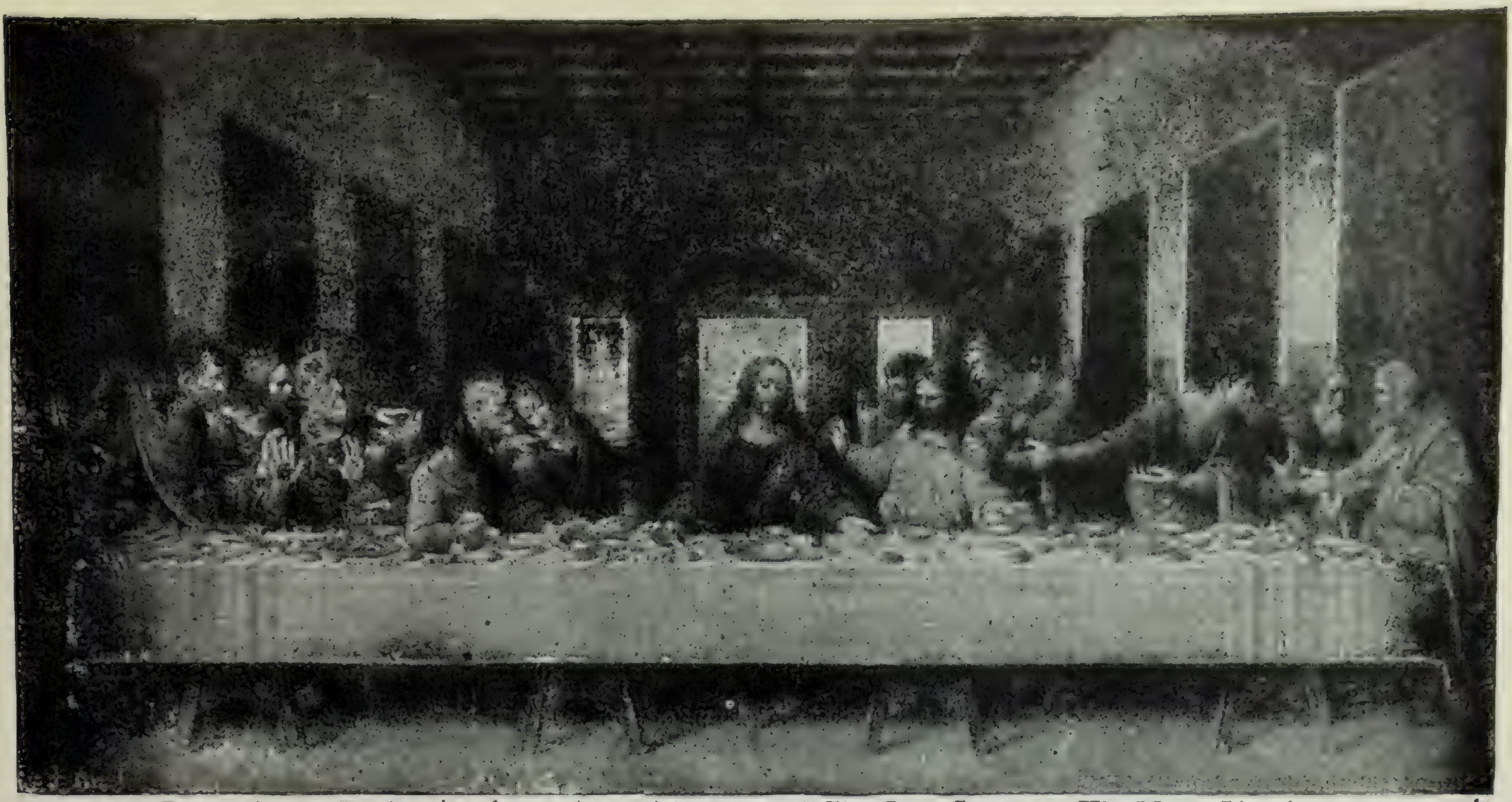
Her unpopularity was a minor cause of the French Revolution. At the outset she was thrown into prison, where she immediately made matters worse by trying to persuade Austria to invade France.

She was convicted and executed. Marie Antoinette was beautiful and brave. At her trial she defended herself with skill and power. Even on her way to the guillotine she maintained a marvellous composure and queenly dignity. (Born 1755, died 1793.)

A MARVEL OF ANCIENT SCULPTURE



The marvellous sculptural group known as "The Laocoon" is believed to date from the first century B.C. It was found at Rome more than four hundred years ago, and is now in the Vatican Museum. The Trojan priest, Laocoon, warned his followers regarding the great Wooden Horse. The god Poseidon sent two serpents from the sea, and they destroyed the priest and his two sons while they were at the altar, officiating at the sacrifice. "The Laocoon" is a magnificent study of pain and horror, and, in the central figure, of agonising effort.



The great Leonardo da Vinci painted this beautiful picture of The Last Supper. His Mona Lisa is on page 737.

WORLD LITERATURE

Do you boys and girls of this wonderful age realise how lucky you are? Had you lived several centuries ago, you would have been shut out from the rest of the world. To-day, however, the whole earth is yours. The literature of every country is at your command, translated into your own language, so that you can read and understand it, and widen your knowledge by learning how the different peoples have put their thoughts into words. In this section you are taken into many different lands and given a glimpse into the lives of writers whose names are immortal. From Bible times we come through the ages to the time of Tolstoy.

THE BOOK OF BOOKS

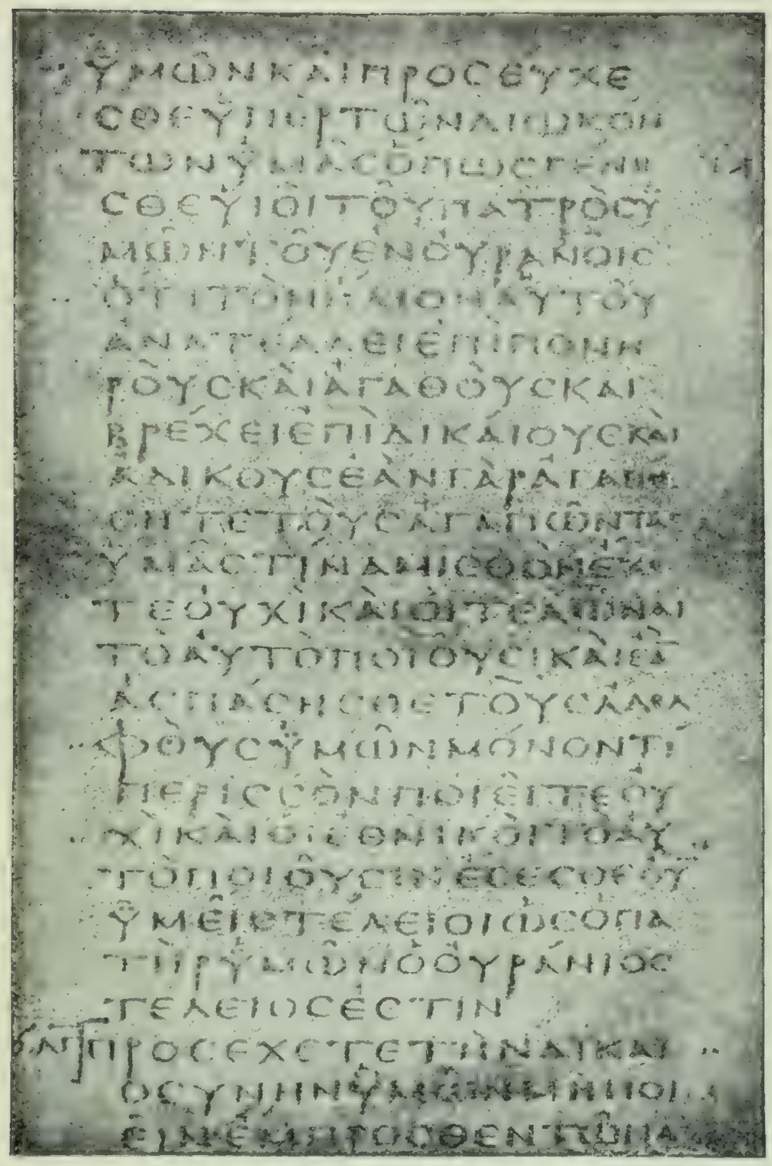
WE are about to set out on a journey of exploration—to discover great books and writers of great books, in all lands and throughout all historic time. This promises to be an adventurous journey, as well as one not without profit, and we hope not without pleasure. On our journey we shall visit many lands, we shall glance at many languages, and we shall take part in many events of world-wide importance. For literature is both the mirror and the occasion of great historical events, and as such is of vital consequence to the world of men.

We are, as we have said before, setting out on a quest for great literature. But before we start we must be quite clear in our minds regarding our search. We must therefore ask ourselves, what *is* literature? This question, though it is a difficult one, may be answered thus: literature is the record of great deeds and great thoughts expressed in the form of writing. Before literature came into existence, there must have been, among ancient men, spoken records of deeds and thoughts, expressed in strong and inspiring language perhaps, but, as they were unwritten, doomed to a rapid death. Literature is thus seen to be the one way of preserving noble thoughts and deeds. Without the aid and encouragement of literature, the mind of man would remain feeble and stunted, and no progress would be made.

If you were asked to name the greatest book in the world, would there be much doubt regarding your answer? Surely not; for the greatest book in all the world is the Bible.

The word *Bible* itself comes from the Greek word meaning *a book*, or *the book*. From its origin, therefore, we can see that its readers from earliest times looked upon the Bible as their one great religious and literary possession. As the ages went on, the value of "the" Book increased. No book has had a deeper and purer influence than our Bible; and to this day the great truths recorded in it remain unshaken.

Everybody knows that the Bible is a very ancient book. In fact, it is two ancient books,



This portion of a page of St. Matthew's Gospel in Greek is from the copy of the Scriptures known as the Codex Vaticanus. It was written sixteen hundred years ago.

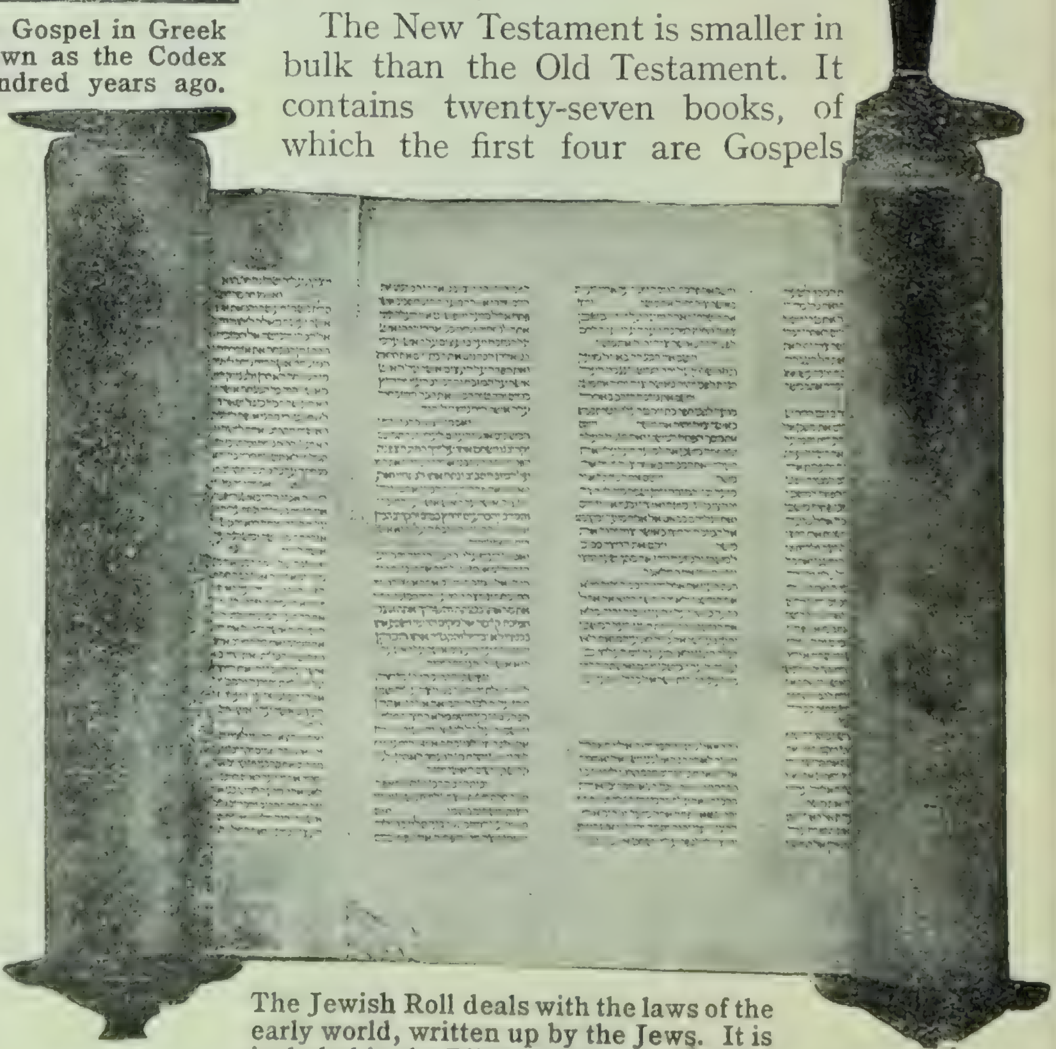
one much older than the other. The older portion is known as' the Old Testament, and contains the sacred writings of the ancient Jewish race. The newer portion is known as the New Testament, which was begun after the coming of Jesus Christ, more than nineteen hundred years ago. All these writings have been handed down to us as one book.

Long before Jesus came to earth, the Jews wrote and studied their sacred books. These, of course, were written in their Hebrew tongue, which, even before the birth of Christ, had become old-fashioned and hard to understand. About two hundred years before the Christian era, the old Hebrew books were translated into Greek, which was the language of learned men. This translation became in its turn the foundation of other translations, which were passed down from age to age until they ended in the magnificent English translation known as the Authorised Version. This name was used because the version was "authorised" by the learned King James I. of England, and it first appeared in the year 1611.

HOW THE OLD TESTAMENT WAS BUILT UP BY THE JEWS LONG AGO.

In making up their Bible, the Jews were careful to select, from among their copious ancient literature, only those books of supreme truth and beauty. Once these were selected, they were arranged into three main divisions. The first was called "The Law," and dealt with the laws of the early world. These books are now the first part of the Bible—Genesis, Exodus, Leviticus, Numbers and Deuteronomy. The second class was that of the Prophets, including such well-known prophets as Joshua, Isaiah, and Jeremiah. To these was added the third class of the Holy Writings, such as the Psalms, and the Proverbs, which are really beautiful poems expressing high moral truths. In all, the Old Testament contains thirty-nine books, making up the most wonderful literary collection in the world.

The New Testament is smaller in bulk than the Old Testament. It contains twenty-seven books, of which the first four are Gospels

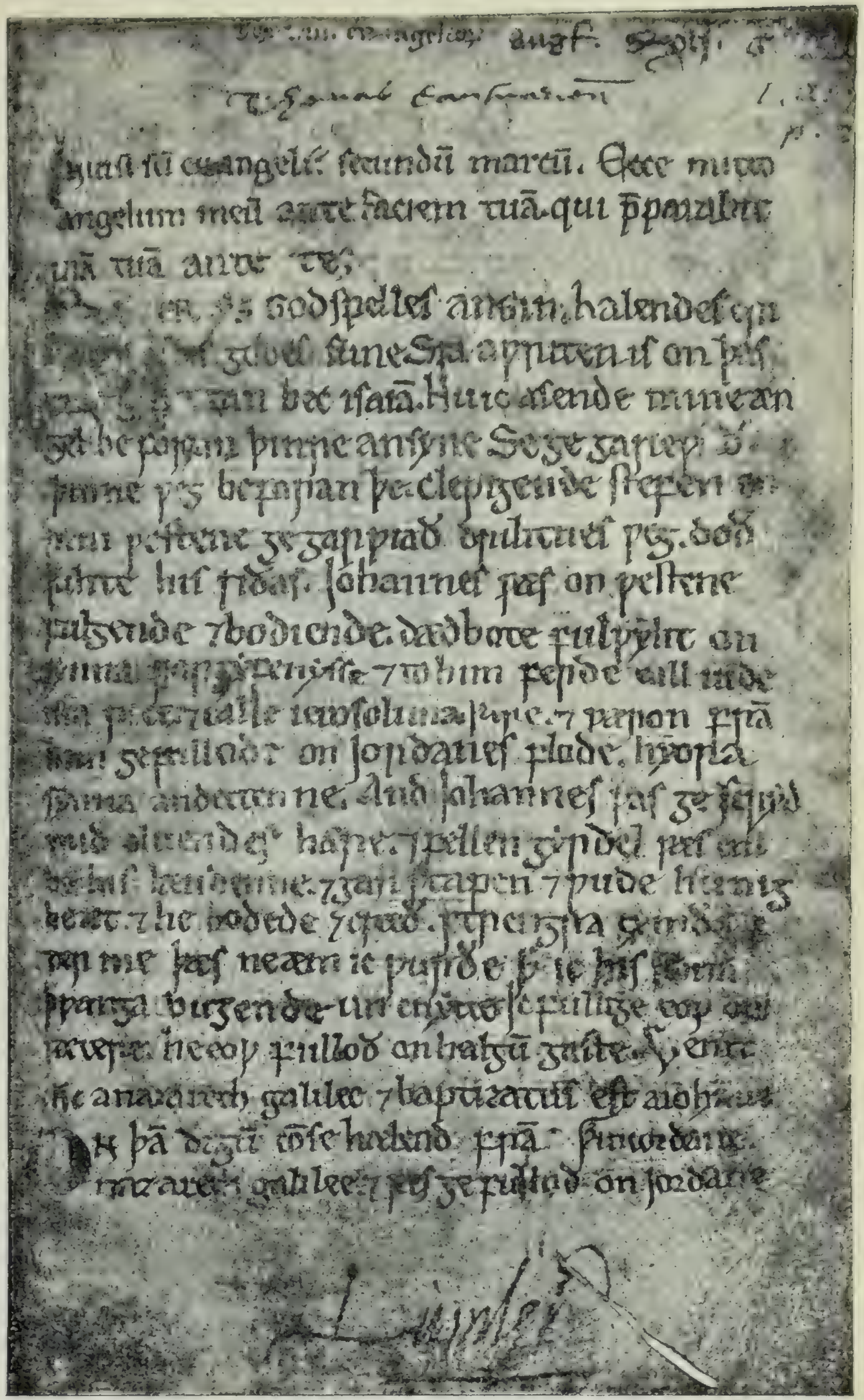


The Jewish Roll deals with the laws of the early world, written up by the Jews. It is included in the Bible as Genesis, Exodus, Leviticus, Numbers and Deuteronomy.

describing the life of Christ upon earth. The next book tells us of the Acts of the Apostles, particularly of the important Apostle Paul. Then follow twenty-one shorter books setting out the ideas underlying the Christian faith, as they took shape in the minds of the enthusiastic early Christians. The remaining book of the New Testament is in many ways the most marvellous of them all. It is a series of visions expressed in glowing language, describing the Lamb of God, and the heavenly city which is His home. This is called the Book of Revelations, and its author is John, the favourite Apostle of Jesus. All these books of the New Testament were written in Greek, which was the language of educated men at the beginning of the Christian era.

THE WONDERFUL STORY THAT IS READ IN MANY DIFFERENT LANGUAGES.

With the exception of the Authorised Version, the finest translation is that done by Saint Jerome, about the end of the fourth century. Jerome called his version, which included only the Old Testament, the *Vulgate,* from the Latin *vulgus,* which means the " common people." Learned men, as we have seen, knew Greek, but the ordinary folks had to be content with Latin only. The Vulgate is a monument of noble Latin prose, and to this day, after fifteen hundred years of use, it remains the standard Bible of the Roman Catholic Church, which, of course, also uses Bibles in modern languages.



This picture shows a page of the Old English (Anglo-Saxon) Gospels, made about A.D. 1000. It belonged originally to the Monastery of St. Augustine at Canterbury, passing later into the possession of Archbishop Thomas Cranmer.

" The " Book, as we now see, is really a collection of books, or rather *two* collections of books, differing widely from each other in length, in subject, in time, and in language. Yet through all these differences run strong and beautiful ideas which give unity to the work.

The greatest idea of all is that of the goodness and oneness of God. The early Jews clung passionately to this idea, which often brought upon them the enmity of the neighbouring nations, who worshipped many gods, some of them wicked and ugly. Among all temptations and trials this belief in the greatness of God emerged triumphant, and it gives vigour and beauty to all the books of the Bible.

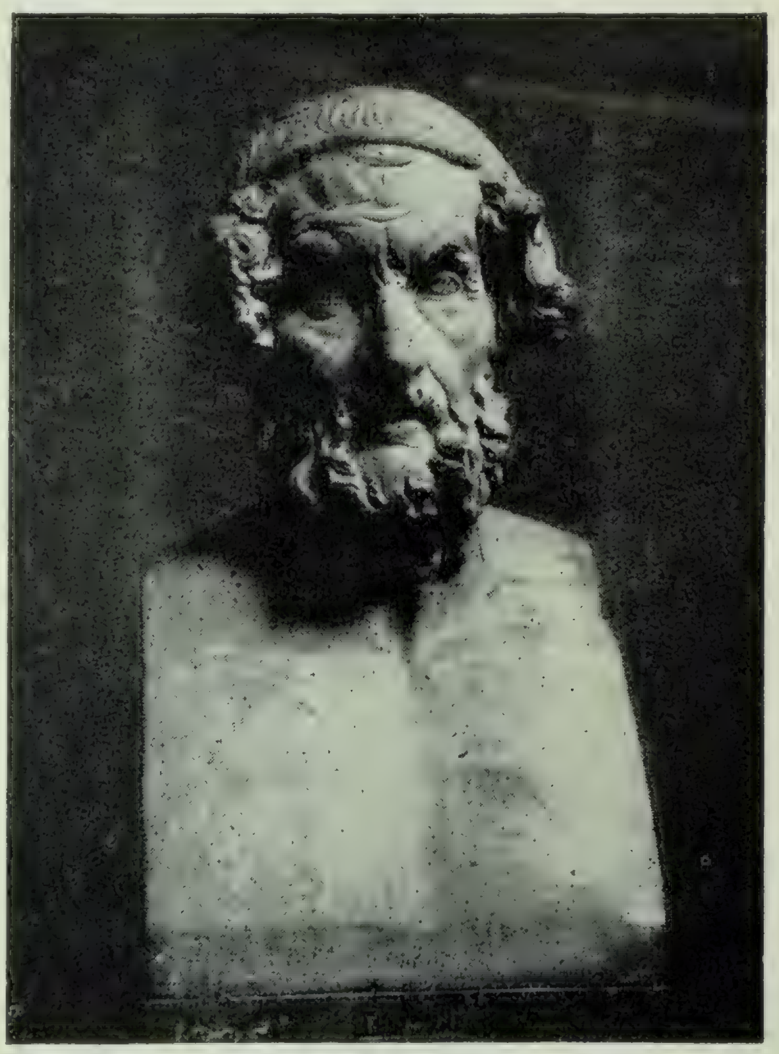
Another outstanding principle of the Bible is that of the value and need of a noble and virtuous life. The older prophets preached this ; the life of Jesus Himself was an example of it. In the Old Testament the idea burns with a fierce and vigorous flame ; in the New Testament the light is more serene and attractive ; but in both it is there.

Noble ideas like these make the Bible what it will always be : the finest inspiration in all literature towards what is purest, noblest, and most unselfish in the soul of Man. In such a spirit the Book was written ; in such a spirit it should be read, and should bring endless joy and consolation to all its readers.

BLIND HOMER, THE FATHER OF GREEK POETRY

THE earliest European literature is Greek; and the most wonderful thing about it is that Greek literature, in spite of its great age, has never been surpassed for excellence. The earliest of all Greek writers is, moreover, in many ways the very best. The name of this marvellous man is Homer.

He lived so long ago that the date of his birth will never be known. The place of his birth, too, will ever be a subject of dispute. It is said that at his death many cities contended for the honour of being his birthplace. If that were so, they certainly started rather late to do honour to their greatest poet, for, according to the usual story, Homer was only a blind beggar who sat at the gates of the ancient city of Thebes and declaimed the spirited stories and ballads which were afterwards combined in his *Iliad* and *Odyssey*. All the details regarding the life of Homer, however, need not be taken too seriously; for many people believe that he did not live at all, and that the name "Homer" is merely that of a collection of ancient tales, written or told by many people, and at length collected and preserved by hands unknown.



Blind Homer, whose tales of classic Greece delight us still.

SOME ENTRANCING GREEK STORIES TOLD BY THE BLIND POET.

It may be doubted if Homer ever lived, but there can be no doubt regarding his supremacy among Greek writers. Even among the earliest Greeks his poems had grown to be almost a religion. In Athens a special law was passed, commanding that his poems should be recited at religious festivals, and valuable prizes were awarded to the best reciters. The poems were continually quoted, discussed, and copied. During the succeeding ages his reputation has hardly waned; until, at the present day, there is no name more reverenced than that of Homer.

The finest of the Homeric poems is the *Iliad*, which tells of the wars against the city of Troy, which the Greeks called *Ilium*.

The date of the Trojan war is lost in antiquity; and the tales concerning its cause and conduct are marvellous beyond belief. Here, in brief, is the familiar story.

HOW THE GOLEN APPLE WAS WON.

Zeus, the chief of the Greek gods, once invited all his fellow gods and goddesses to a banquet, omitting, however, to invite the goddess of Discord. To avenge herself of this insult, the goddess rolled into the midst of the assembly of the gods a golden apple, which bore the inscription *To the Most Beautiful*. Three goddesses—Hera, Athene, and Aphrodite—laid their claims for the apple before Paris, a handsome shepherd-boy. All three tried to bribe him, but Aphrodite (the goddess of Love) was so anxious to win the golden apple that she offered the most tempting bribe of all, and one that made Paris decide on her.

HOW THE FAMOUS TROJAN HORSE HELPED TO GAIN A VICTORY.

She promised to give him, if he awarded the golden apple to her, the loveliest wife in the world. The splendour of the gift overcame his scruples, and he presented her with the apple. In this fashion Helen, the wife of Menelaus, a Grecian prince, became his prize, and she was carried off. Menelaus called upon his fellow-princes to aid him in rescuing Helen. A great fleet was assembled, and after several mishaps set sail for Troas, a district in Asia Minor, and there the Greeks besieged the many-towered city of Troy.

The siege lasted ten years. Many notable deeds were done, both by the warriors themselves and the gods and goddesses who took sides with them. The hero of the Trojans was

Hector, the oldest son of the aged King Priam of Troy. Opposed to him was the terrible Achilles, the most brilliant of all the Greek champions. He slew Hector, and insulted his dead body; but he himself was slain, and the Greeks despaired of victory. At last, they pretended to depart, but they left behind them a huge wooden horse, which the Trojans seized as a trophy and which they drew within their city. But the horse was hollow, and it held a number of picked warriors, who, during the night, opened the gates of Troy to the other Greeks, who had stolen back under cover of darkness. Troy perished in fire and slaughter, and the great race of the Trojans was no more.

HOW HOMER TELLS OF THE STIRRING ADVENTURES OF ODYSSEUS.

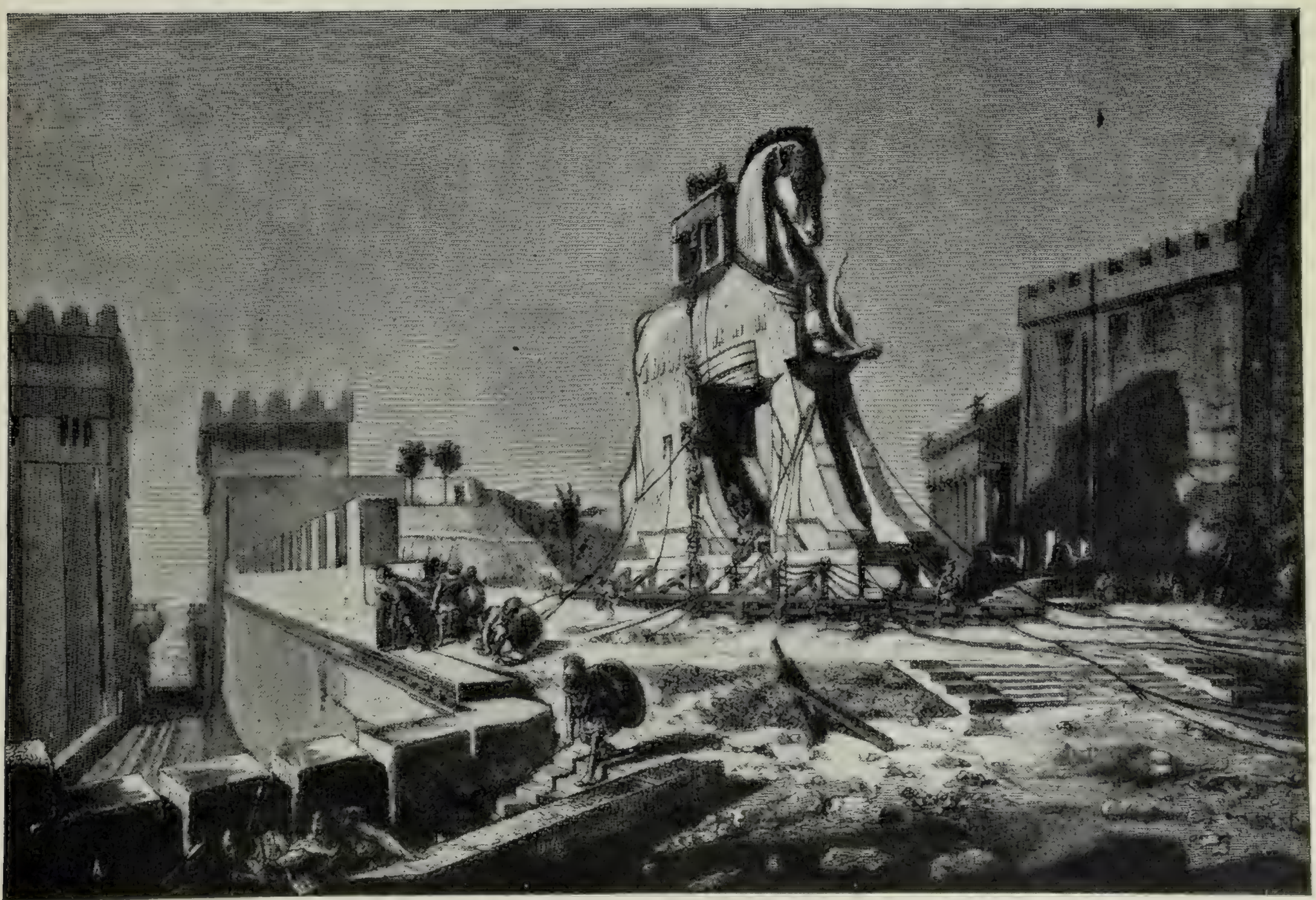
The *Odyssey*, Homer's second poem, is really a continuation of the *Iliad*. The hero of the poem is Odysseus, a Greek prince, who sets out for home after the capture of Troy. The distance to Ithaca, his island-home, is not great; but he brings upon himself the wrath of the gods, and for many years he wanders the wide seas, along with his faithful mariners. Numerous amazing adventures befall him. He falls a victim to the witch, Circe; he avoids the snares of the Sirens; he escapes from the toils of the one-eyed giant Cyclops; but these, and many other troubles, are all in the end safely overcome, and he is reunited to his faithful wife Penelope, who has waited for him all these weary years.

Such are the two poems of Homer, told in his splendid swinging verse, and in the powerful and melodious language of ancient Greece. No succeeding poet has bettered them; on the contrary, they have proved a model and an inspiration to all poets since, as will soon be seen in the pages that follow.

PENELOPE'S SCHEME TO KEEP TRUE TO HER HUSBAND ODYSSEUS.

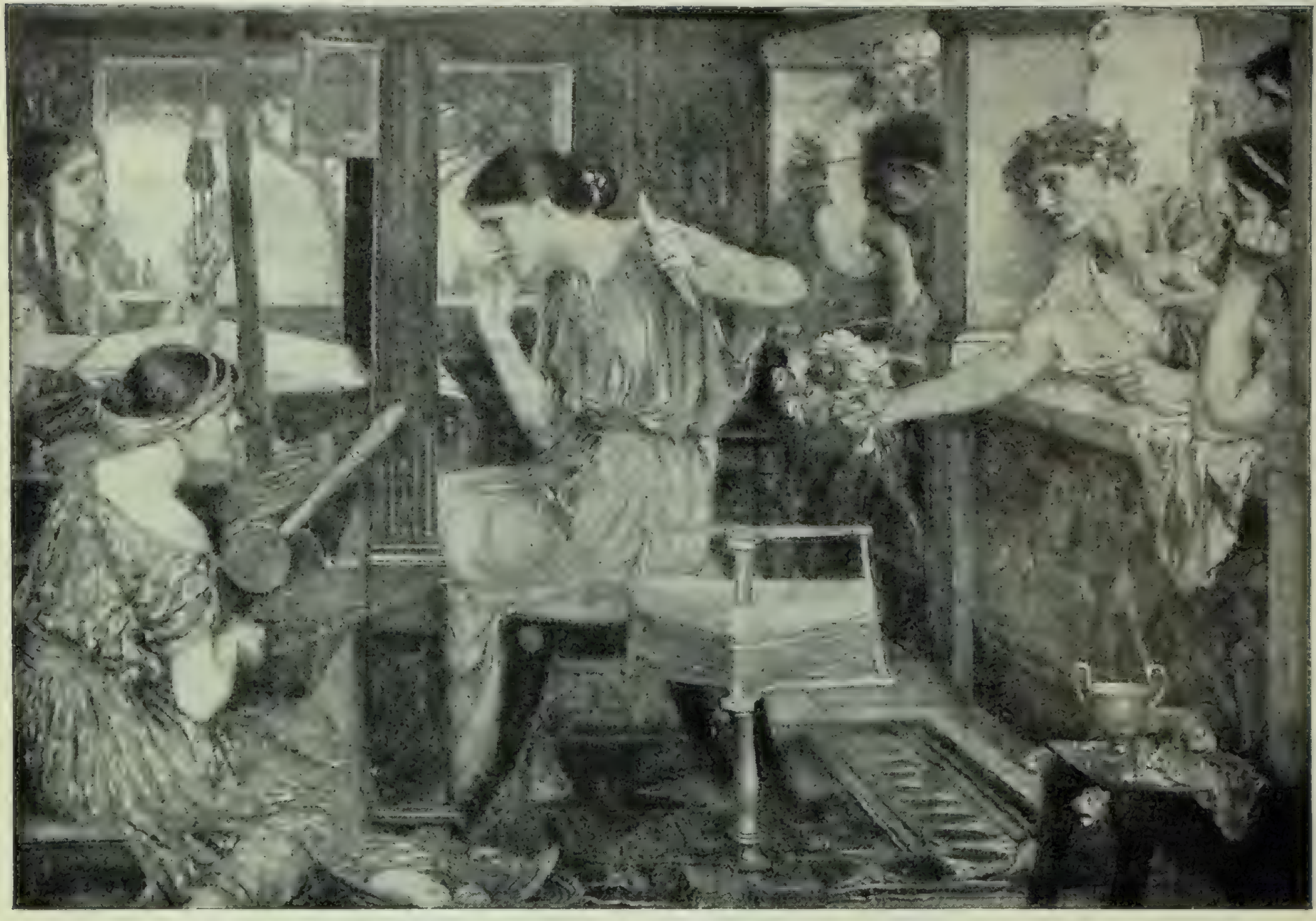
When her husband set out on his voyage, Penelope found that many young men paid court to her and wished her to marry them. Penelope was true to Odysseus, however, and as a ruse to foil their attempts at love-making she began to weave cloth for a robe for her father-in-law.

She promised to select from her many admirers a husband when her task was complete. Every day she wove, and every night she undid all she had done. So the robe was never completed, and when Odysseus, after many terrifying experiences, at last returned, he found her waiting, still faithful and true.



The great wooden horse in which the Greek soldiers cleverly concealed themselves outside the walls of the ancient city of Troy. Under cover of darkness they came out into the city and paved the way for victory over the Trojans.

VIRGIL, THE GREATEST POET OF ROME



Penelope at her loom. Virgil learned much from Homer's *Odyssey* and modelled his *Aeneid* upon it.
Painting by G. W. Waterhouse, R.A.] *[Aberdeen Art Gallery*

VIRGIL was born on the 15th of October, in the year 70 B.C., that is, almost a thousand years after the presumed birth of Homer. In this long interval the great Greek Empire had risen, had prospered, and then had withered away. The exploits of great warriors, and the pens of great writers, had lavishly adorned this Empire when it was in its prime. As the years rolled by, the fruits of military conquest shrivelled and vanished, never to return ; but the victories of her immortal literature remained undimmed. The Roman legions, drawn from a younger, hardier, and more practical race, struck into ruins the fabric of the Greek Empire just when it was ready to fall ; but Roman literature was in turn subdued by the literature of the people they had conquered. Virgil himself, the greatest of Roman poets, is an example of the way in which the writers of Rome were peacefully overcome by the writers of Greece.

Virgil was born in the most spacious days of the Roman Empire. The fairest part of Europe, namely, that south and west of the great rivers Rhine and Danube, was Roman ; the legions had marched to the rivers of Mesopotamia in Asia ; the North of Africa, as far south as the immense desert of the Sahara, was Roman too. No wonder that a Roman looked around the civilised world with a thrill of pride, for all the world was subdued to the will of Rome.

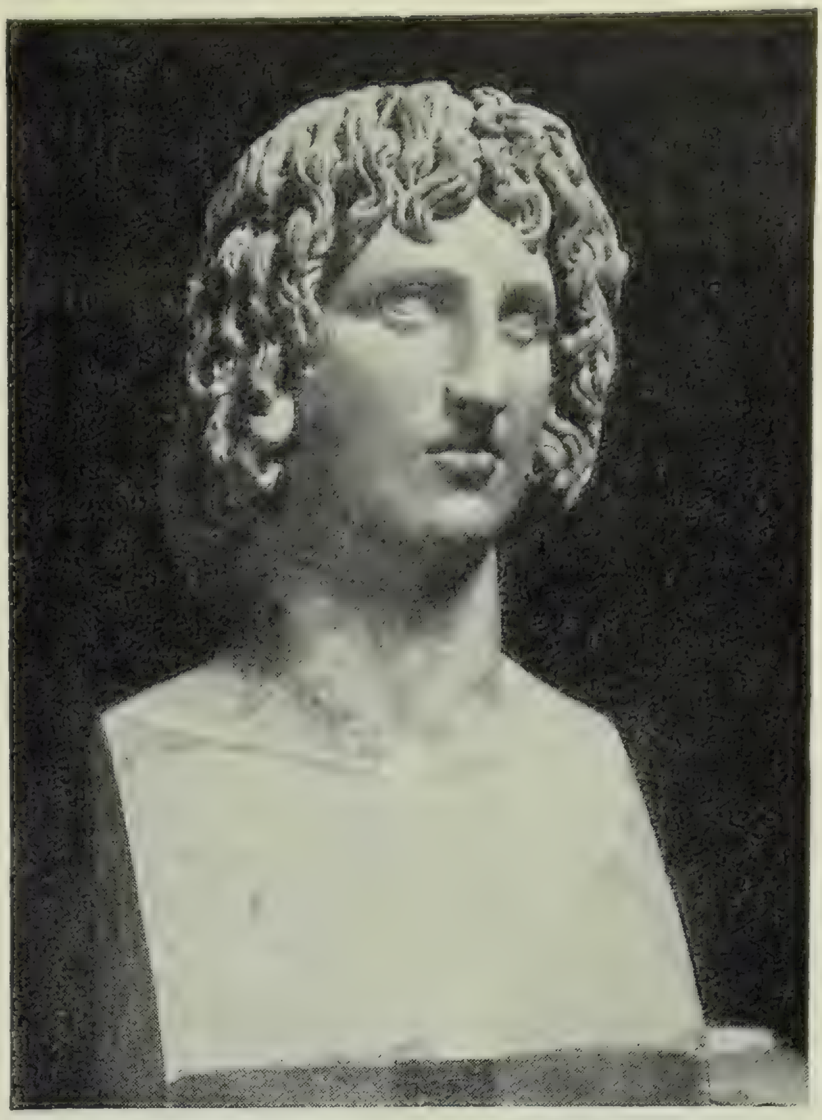
Yet, though Virgil lived to be the most famous of all the poets that sang the praises of Rome, he was not born a Roman citizen. The town of Mantua, near which he was born, was so far away from Rome, in the north of Italy, that Virgil was a grown man before his native province was given the full rights of Roman citizenship. Virgil's father was a yeoman farmer, who spared no trouble and expense to give his son the best education then available. It is pleasant to think how richly his father was repaid. As a boy Virgil studied at Cremona and Milan, the most famous cities of northern Italy, and then, as a young man, he went to Rome, the centre of the world.

At that time momentous events were stirring in Rome. The exploits of Julius Caesar, and of his friends and enemies, were convulsing the world. The turmoil came to a head with the murder of Caesar in 44 B.C. (when Virgil was a young man of twenty-six), and with the terrible civil wars that followed. During the latter portion of these troublesome years Virgil seems to have withdrawn from Rome to his native Mantua. Nevertheless the disorders followed him there. His father was driven from his farm, and only the efforts of the influential friends that Virgil had made in Rome saved the old man from complete ruin. Thus early the good father had cause to bless the chances he had given his son.

THE POET WHO WROTE ABOUT THE POWER AND MAJESTY OF ROME.

After these stirring days came a period of comparative calm. Virgil returned to Rome, wrote poetry, and became acquainted with other famous men. One of his friends was the poet Horace, who wrote short poems called Odes, and who next to Virgil is perhaps the most admired of Roman authors. Virgil became known even to the Emperor Augustus, the nephew of Julius Caesar, who in a few years after his uncle's death had subdued most of the Roman Empire and was now its sole master.

Virgil's meeting with Augustus was the most important event in his life. It happened in 29 B.C., in Rome, when the poet read the most important of his early works, *The Georgics*, to the Emperor. This poem, which deals with country matters, was warmly praised by Augustus, who urged him to go on and write on more heroic subjects, especially the most heroic subject of all in the eyes of the Romans—the might and majesty of Rome.

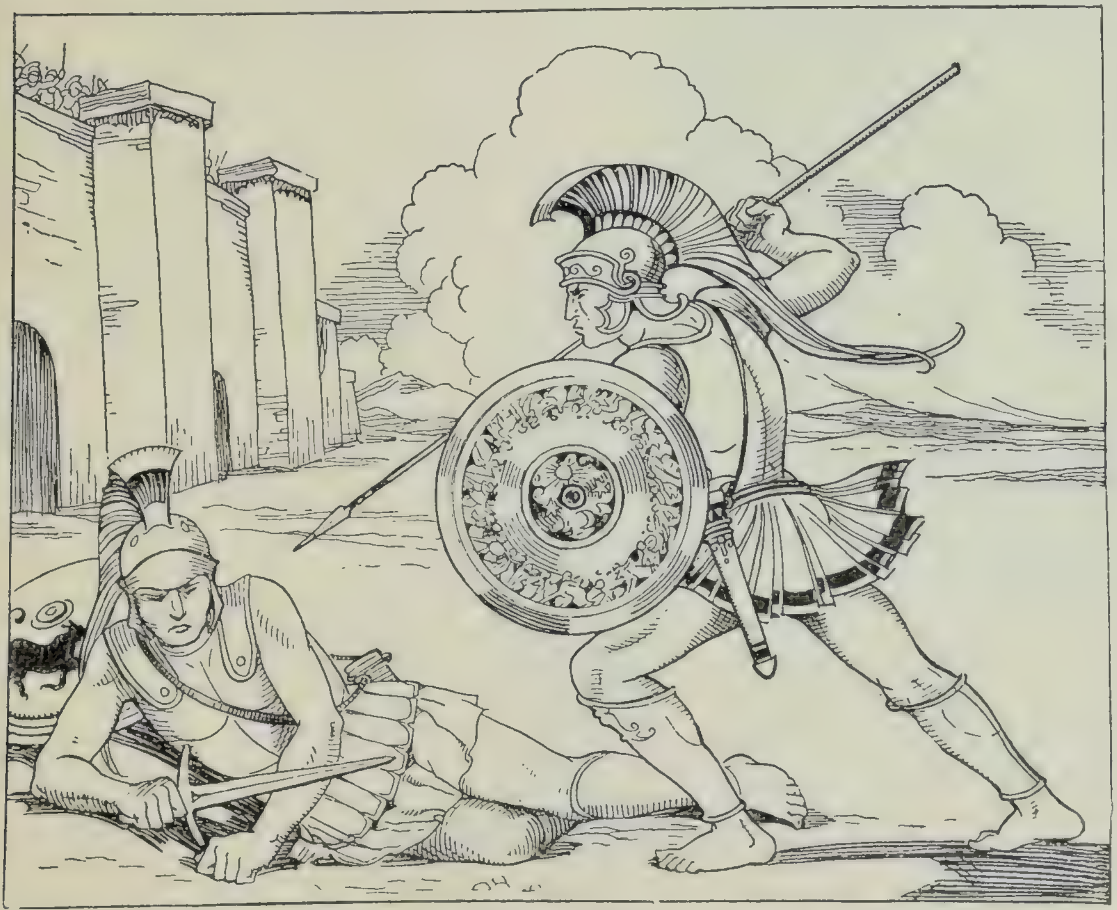


Virgil, who was born in the year 70 B.C., wrote many stirring poems about Ancient Rome that have earned for him lasting fame as one of the world's greatest poets.

HOW VIRGIL'S GREAT POEM, THE "AENEID," WAS CONNECTED WITH HIS DEATH.

Fired with the applause and advice of the Emperor, Virgil set to work to write a long heroic poem dealing with the foundation of Rome. The result was the *Aeneid*, a magnificent poem which, second only to the *Iliad* and *Odyssey* of Homer, is the ornament of classical literature.

The *Aeneid*, in its plan and development, is based upon the Homeric poems, especially upon the *Odyssey*. The hero of Virgil's poem is Aeneas, a Trojan warrior, who is mentioned by Homer as being second only to Hector, the Trojan leader. After the fall of Troy, Aeneas flees for safety to the coast, carrying his aged father on his back and leading his little son Ascanius by the hand. Then, like Odysseus, he sets off on a long and adven-



The Greek hero, Achilles, who was invulnerable, except in his heel, is seen attacking Hector of Troy. Homer recounts his exploits in his famous *Iliad*.

turous voyage. He sails past many lands, and is cast up by a storm on the coast of Africa, where he meets Dido, queen of Carthage, who begs him to remain with her. This he refuses to do, and sails away into the unknown. Dido, broken-hearted, destroys herself. After seven long years of wandering he lands in Italy, at the mouth of the Tiber, is welcomed by Latinus, King of Latium, and marries his daughter Lavinia. Turnus, a rejected suitor of Lavinia, attacks Aeneas and Latinus, but is defeated and slain. The *Aeneid* finishes with the death of Turnus, but from other historians, particularly from Livy, the most famous of them all, we learn that Aeneas is regarded as the mythical founder of the Latin kingdom.

It is rather sad to think that Virgil's great poem was connected with his death. In 19 B.C. he had finished the composition of the poem, but he was not satisfied with it. He set out for Greece, intending to stay there for some years and make his poem perfect. In Greece he met Augustus, who persuaded him to return to Italy with him. On the way home Virgil was struck down by the burning sun, and became ill with violent fever. In spite of his illness, he struggled on homewards. A few days after he landed at Brundisium, in Italy, he died. He was buried at Naples, where his tomb was long regarded with almost religious awe. He left behind him a name and reputation which were to shine undimmed through all succeeding ages.

THE SONG OF ROLAND

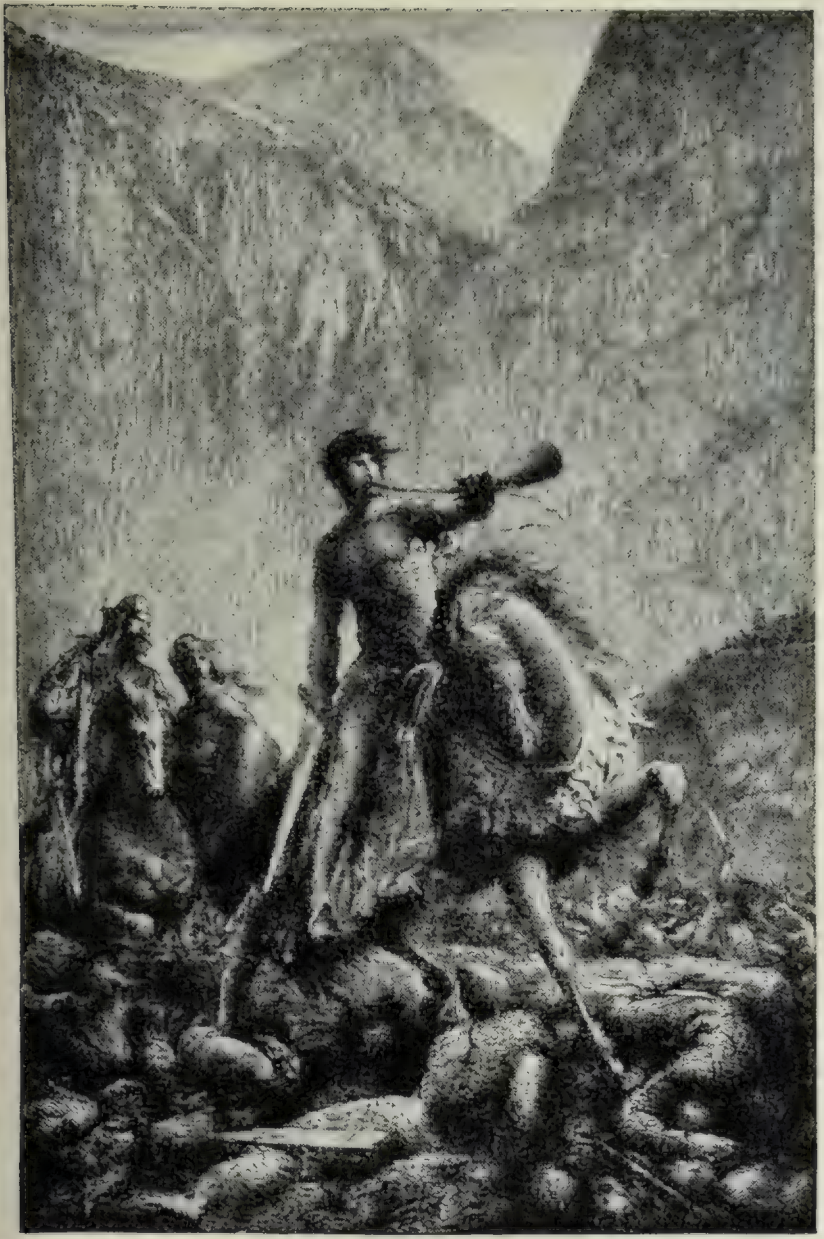
AFTER the death of Augustus, the Roman Empire, which had been slowly decaying, rapidly fell to pieces under the hammer-blows of the barbarian peoples who had been its subjects. In A.D. 412 Rome itself was taken and plundered, and what had once been Roman provinces, such as Gaul (France), Spain and Britain, became independent countries. During the Middle Ages, however, various rulers of the barbarian peoples aspired to restore the Roman Empire, and hold its crumbling pieces together. The greatest of these was the Frankish ruler, Charlemagne, who, on Christmas Day in the year A.D. 800 was crowned in Rome by Pope Leo as Emperor of the West.

Charlemagne's Holy Roman Empire, as it was called, did not survive his death. But with his name many heroic legends became associated and during the Middle Ages generations of minstrels (or troubadours) recited them to assemblies of lords and ladies. The finest of all these romantic tales in verse is in Old French, and is called the *Chanson de Roland* or the *Song of Roland.*

The Frankish ruler, Charlemagne, who was crowned in Rome in A.D. 800, seen urging his men on to battle. Many romantic legends are associated with this great Emperor and warrior's name.

It describes the heroic deeds of Roland, Charlemagne's noblest warrior, who had a bosom friend called Oliver. With these two were associated ten other warriors, almost as famous. These twelve paladins (so they were called) led the Christian hosts of Charlemagne against the hordes of pagan Saracens.

In 778 Charlemagne invaded Spain with his Frankish army, and for seven years he battled with the Saracens, who had crossed over from Africa and had gained possession of the country. At last all Spain had been recovered for the Christians with the exception of Saragossa,



The wounded Roland, in the famous legend, *The Song of Roland,* blows on his horn to summon Charlemagne to his assistance, before he collapses on the field.

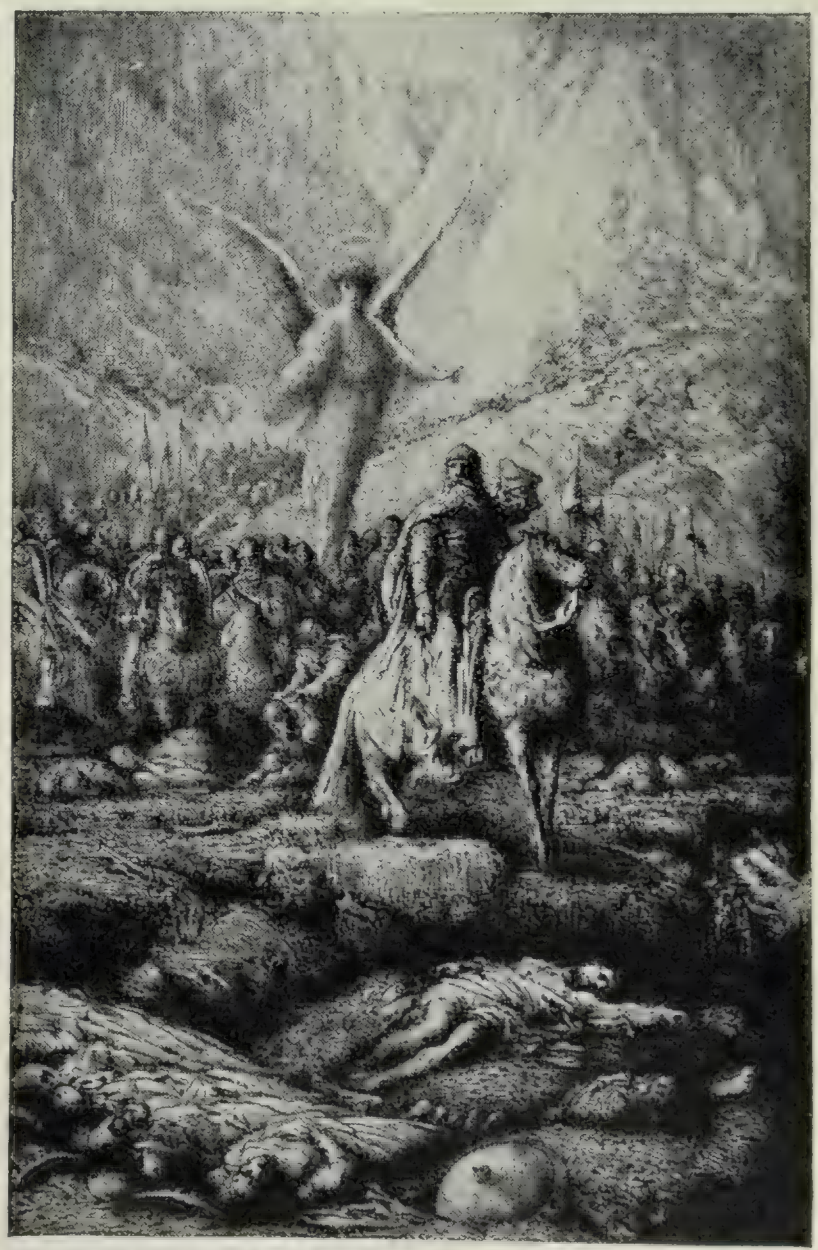
the seat of the Saracen King Marsile. The Saracen king sent an embassy, saying that he would submit on condition that Charlemagne and his army would leave Spain.

THE WOUNDED HERO SOUNDS HIS HORN WITH HIS DYING BREATH.

The paladins were eager for war, but Ganelon, the villainous step-father of Roland, advised peace, and his counsels prevailed. Ganelon was sent as an ambassador to Marsile, with whom he plotted to betray Roland and his friends for ten mule-loads of gold. The Franks began to withdraw northward, through the dangerous defiles of the Pyrenees, and Roland and his paladins were given the most dangerous task, that of covering the retreat. Near Roncevaux, in the most difficult of the Pyrenean passes, the plot of Ganelon came into operation. Oliver, mounting a high rock, perceived a host of four hundred thousand Saracens advancing. He flung the Christian rear-guard upon them, and a series of terrific battles ensued. Division after division of the pagan army was hurled into the battle, only to be destroyed in turn. Roland's soldiers, also, melted away in the combats, until only sixty remained. Then, and only then, would Roland consent to sound his horn, which, echoing over many miles of mountainous country, would bring Charlemagne to his assistance. Charlemagne, hearing the signal, hurried with his main body back to the field of battle, to find that Roland alone, of all his host, remained alive, though wounded unto death. The dying hero heard the war-cry of his approaching comrades, he beheld the Saracens in full flight, with his last breath he sounded again his war-horn, and then died upon the field of battle.

SOME OLD LEGENDS THAT STIR THE BLOOD AND FIRE THE IMAGINATION.

Such is the *Song of Roland,* told in spirited verse that moves the blood like the sound of a trumpet. Many other romances were written, some about Charlemagne, others about King Arthur and his Knights of the Round Table, others again of commoner folk and humbler incidents. All of them make fascinating reading.



Charlemagne rushes to the aid of his nephew, Roland, and finds him dying on the battlefield among his stricken comrades. He was the only one who still breathed.

THE ICELANDIC EDDAS

WHEN we come to talk of the Eddas, we leave the pleasant lands of France, Spain and Italy, with their vineyards, their cornfields, and their warm sun and shining rivers. We are bound for the regions of the far north, even to Iceland, the land of frozen seas and fiery volcanoes.

About the year 870 a Norse jarl or earl, called Harald the Fair-haired, fell in love with the blue-eyed Grida, a noble maiden, who disdained to return his affection unless he conquered all Norway for her. So Harald vowed never to cut his fair hair until all Norway became his. He succeeded in his ambition, attacking jarl after jarl who reigned along the glens and sea-lochs. Most of the jarls submitted to their conqueror; but the boldest and most independent of them, rather than bend the knee to Harald, sailed away to the icy north and planted a new kingdom in the far-off island of Iceland. There they struggled and prospered, cut off from their native land, but never ceasing to be strong, free, and noble-hearted members of the race from which they had sprung.

WHAT ARE THE EDDAS AND WHY ARE THEY SO WELL KNOWN IN ICELAND?

In Iceland the winter nights are dark and endlessly long. Save for the beams of the moon, and the ghostly flickers of the Northern Lights, darkness reigns for months on end. On such occasions the exiled Norsemen could neither hunt, nor fish, nor sail the seas; so to pass away the time they would gather round the fire and tell endless tales of the old days in their native Norway. Most of these tales were brought to Iceland along with the first settlers; but as the years went on the early stories were expanded and changed; other tales were added; and so gradually there grew up two immense bodies of stories, one in verse and one in prose, which came to be known as the *Eddas*.

Every dweller in Iceland was supposed to know and recite the Eddas. "Not to know the Eddas" came to be considered as a confession of ignorance regarding everything that mattered.

What is called the Elder Edda was discovered by an old Bishop of Iceland in the year 1643. It consists of a collection of old leaves of vellum, covered with stories composed in the ancient Icelandic speech. This is the language used by the *skalds* or early poets, who, like the minstrels of Roland and other heroes, sang of warlike deeds to assemblies of lords and ladies. The prose collection is called the Younger Edda, though it has been the pride of Icelandic literature for nearly a thousand years. Many hands, many brains, and many voices have gone to the making of these wonderful books.

FIERCE AND WARLIKE TALES TOLD ROUND THE FIRE IN THE LAND OF ICY COLD.

It would take many pages to summarise the contents of the Eddas. Briefly, however, we can say that they give us the records of the heroic deeds of the northern gods, heroes, men and spirits. They tell us, too, of the creation of the world, as the Norsemen imagined it; of the mighty ash-tree, Ygdrasil, the tree of life, whose roots penetrate to Hell. A serpent gnaws at its roots, and in its branches lives an eagle, and a squirrel runs up and down its trunk, ever making mischief. The Eddas tell us also of the great gods Odin and Thor, and the beautiful god Balder. They take us to the gloomy and terrible Frost-lands and Fire-lands, and the great hall of Valhalla, with its five hundred and forty doors, where the souls of the heroes who have died in battle live on in a round of fighting and feasting. Some of the tales told are humorous; others, such as that of the Swan-maiden, are very beautiful; still others are grim tales of vengeance.

HOW THE GREAT GOD THOR RECOVERED HIS LOST HAMMER.

One of the stories known as "The Song of Thrym" tells of the great god Thor, who is represented as possessing a great hammer. He unfortunately lost it on one occasion, and discovered that it had been stolen from him by a giant, by name Thrym. Thor demanded that it should be returned to him, but Thrym refused. He said he would relinquish the stolen property, however, if the goddess Freyia was sent to him to become his wife. Then Thor thought of a plan. He dressed himself in woman's garments, to make himself appear as Freyia, and went to Thrym. The giant's delight was short-lived, for Thor slew him and took the hammer back with him to his home. Many other tales are told; and nearly all of them are grim and terrible, suited to a folk warring eternally with the ice, the dark, and the cold. Yet, nevertheless, in them all we can discern a beauty and a charm which help to give them a place among the greatest books in the literature of the world.

DANTE: ITALY'S MASTER POET

LISTEN to these moving words: " Already nine times after my birth the heaven of light had returned as it were to the same point, when there appeared before my eyes the lady of my mind, who was by many called Beatrice who knew not what to call her. She had already been so long in this life that she appeared to me about the beginning of her ninth year, and I saw her about the beginning of my ninth year. Her dress on that day was of a most noble colour, of a subdued and goodly crimson, girdled and adorned in such sort as best suited with her tender age. At that moment I saw most truly that the spirit of life, which hath its dwelling in the most secret chamber of the heart, began to tremble so violently that the least pulses of my body shook therewith; and in trembling it said these words: *Behold a god cometh stronger than I, and it will overcome me.*"

Later in life, a saddened and disappointed man, Dante wrote these words, looking back over a gulf of years that seemed longer by their sorrow. But across these years the light that had so long guided him shone undimmed. Dante's love for Beatrice is one of the purest and most pathetic incidents in the life of any poet. Let us see how it came to pass, and how it affected his life and works so deeply.

THE POET WHO LIVED IN THE LAND OF VINEYARDS AND LEMON-GROVES.

In the pleasant Italian city of Florence, situated upon the River Arno, among its vineyards and lemon-groves, Dante was born in the year 1265. Florence was indeed a beautiful city; but its citizens did not seem to be made peaceful with its beauty, for they were continually engaged in furious quarrelling. There is no need here to give an account of the different sections into which the Florentines were divided, and which slew and plotted against each other incessantly. Neither is it necessary to tell of the many times that the city was captured by one party, which in its turn was driven out by the other. All we need say is that these matters were of burning and primary interest to the poet Dante. Nowadays it may seem strange to us that this dreamy, serious-minded poet, with his pale face and burning eyes, should concern himself so deeply with the black and murderous business of Italian politics. But he became so deeply interested in them that at last he was elected a prior or leader of the Florentine party known as the Bianchi, or Whites. His enemies were called the Neri, or Blacks.

But during this time not all his attention was given to politics. He wrote beautiful poetry; he read the great classical writers—Homer, Virgil and Horace; and, as we have seen, from his early youth he loved Beatrice.

HOW DANTE'S GREAT LOVE FOR BEATRICE REMAINED UNCONFESSED.

This lady was the daughter of a Florentine nobleman. Dante met her at her father's house, and henceforth and in secret his life was devoted to her. He met her rarely; he spoke to her even more rarely; so his love for her remained unspoken and perhaps unsuspected.

Why did he not avow his love for Beatrice? Perhaps it was mere shyness, for no man could be more proud and reserved than this pale Florentine. Or perhaps it was the feeling that Beatrice was too pure and remote to be the subject of any earthly affection. He said himself, " It is my hope that I shall yet write concerning her what hath not before been written of any woman." How he fulfilled that hope we shall soon see.

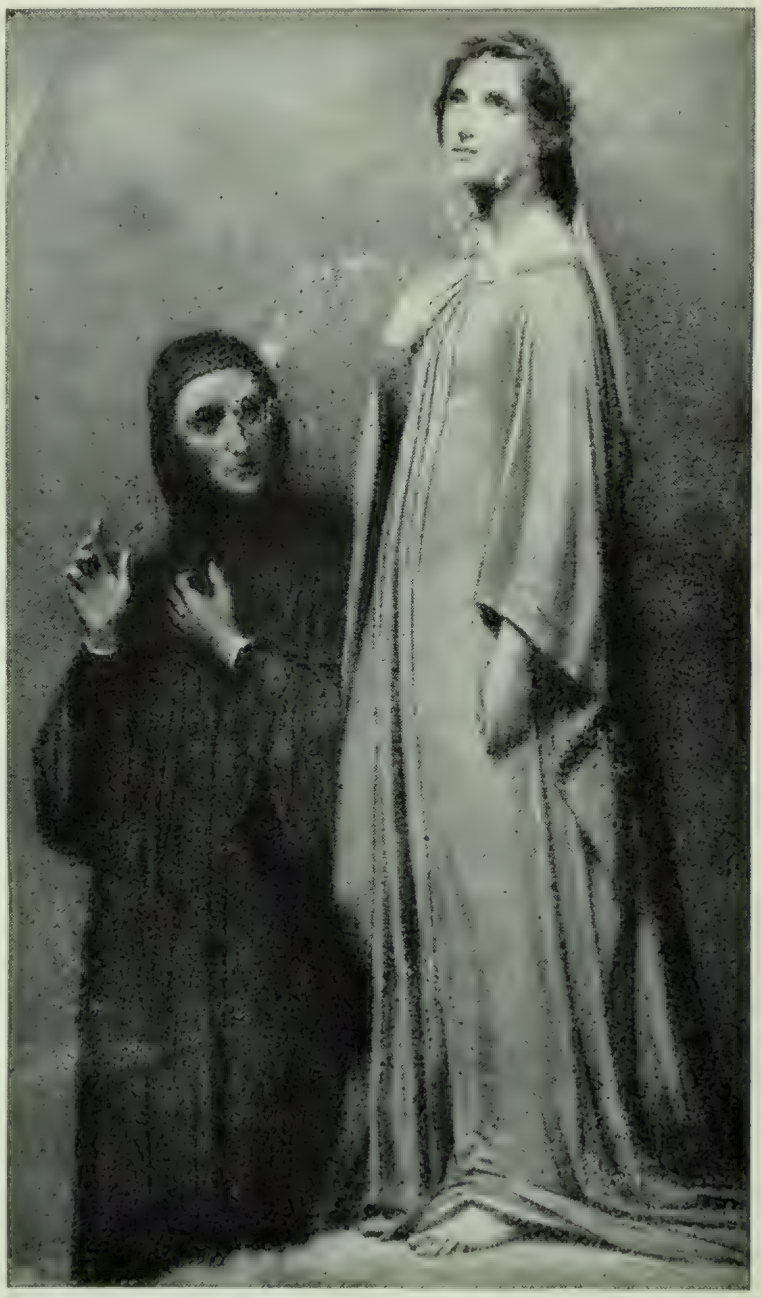
Whatever were his reasons for keeping silence, Beatrice never knew of his feelings, and she married another man. Shortly after this she died, and passed, as Dante loved to imagine, into the bliss of Paradise. In the course of time he himself married; but he never forgot the blessed vision of his beloved Beatrice.

Years went by. Dante wrestled with his political enemies, who at last grew too strong for him. In the year 1300 he was sent on a mission to the Pope at Rome, and during his absence his foes seized Florence and issued a decree condemning Dante and his friends to life-long exile. Such a decree imposed upon him a living death. To him Florence was almost as dear as life itself. All his hopes, joys, and happiness were centred in it; and he was to see it no more!

DANTE WANDERED THROUGH MANY COUNTRIES, BUT LEFT HIS HEART IN ITALY.

For twenty years longer he wandered the bounds of Italy. At one time he journeyed as far as Paris, and for a few uneasy months he stayed there. There was a story even that he penetrated as far as distant England, but not many people believe that now. But wherever he went, and whatever he said, his heart was ever in Florence. In dreams, he says, he often revisited the city of his youth and of Beatrice, and ever awoke in tears to the pain of reality. At times he was cheered by a faint ray of hope that his sentence of exile would be recalled, and that he would be able to return; but all these gleams faded away before long. Once, indeed, in 1315, he was told he might return if he would pay a large fine and walk in a dress of humiliation to the Church of Saint John and do public penance for his offences. Dante might have paid the fine; but his haughty spirit revolted at the thought of the public shame. He refused; and Florence saw him no more. In 1321, while staying near the unhealthy swamps of Ravenna, he caught the local fever and died. He was buried in Ravenna, far from Florence, and so even in death his exile was unbroken.

Hundreds of years afterwards, when Italy became a united kingdom, his doom of exile was reversed by making Florence and Ravenna, and all the other cities of his wanderings, one country—the country of Dante. In this belated and ingenious manner the great Italian poet came to his own at last.



Dante, the poet who wrote *The Divine Comedy*, with his beloved Beatrice, who inspired his greatest poems. His is one of the saddest and most beautiful of love-stories.

Dante loved and hated deeply. What other men felt in a languid and imperfect manner, he felt with burning heat and fury. And such emotions are seen and felt in the greatest book of the middle ages, in what he called the *Divine Comedy*.

THE GREAT POEM, WRITTEN BY DANTE, DESCRIBES THE REGIONS OF PURGATORY AND HEAVEN.

Nowadays we are accustomed to think of comedies as light and cheerful compositions, giving us many a merry laugh. But laughter was far removed from the fiery soul of Dante. His book is really a survey of the three vast regions which, according to the ideas of the Middle Ages, lay outside the earth. These regions were Hell, Purgatory and Heaven. His *Divine Comedy* is therefore divided into three main portions: Inferno (Hell), Purgatorio (Purgatory), and Paradiso (Paradise).

His poem is very long, and it is crammed with details of events and with hosts of personages of all kinds. The main plan of it is, however, quite simple.

In his beautiful Italian language he begins by telling how he is wandering through a forest on the Thursday morning before Easter, in the year 1300. His way is suddenly barred by three furious beasts, a wolf, a lion and a leopard. All seems lost, but all at once the poet Virgil appears before him. The great Latin poet salutes his disciple, saying that he (Virgil) has been commanded by three ladies, namely, the Blessed Virgin, Saint Lucy and Beatrice, to guide him through the regions of the next world. Under the guidance of Virgil, Dante is first taken to Hell. They sink lower and lower, through the three awful regions of Hell. On the way they encounter throngs of condemned souls. Popes, kings, poets, warriors and humble folk of all sorts—all are there. Most of them are atoning for their sins on earth by suffering dreadful torments. At the very bottom of the pit of Hell lies the Devil, Lucifer, fixed for ever in ice.

Dante and Virgil climb down Lucifer's limbs to the centre of the earth, and then by clambering upward for a day and a night they reach the surface of the earth and the beginning of the mountain of Purgatory. This region is inhabited by souls who have repented too late, and are now suffering a period of penance.

The two poets climb its seven steep terraces, at the top of which is the Earthly Paradise. Here Virgil departs, Beatrice appears, and she conducts Dante into the presence of God Himself.

Such is a brief summary of this tremendous poem. Many clever men have puzzled over it, because it is difficult to understand, on account of its many veiled allusions to Dante's friends and enemies. The poet's religious ideas, moreover, are frequently expounded in a very mysterious manner. We may not clearly understand this part of the poem ; but all of us cannot fail to see the force of imagination and the power of brilliant description that crown his greatest book.

CERVANTES, THE SOLDIER WRITER OF SPAIN

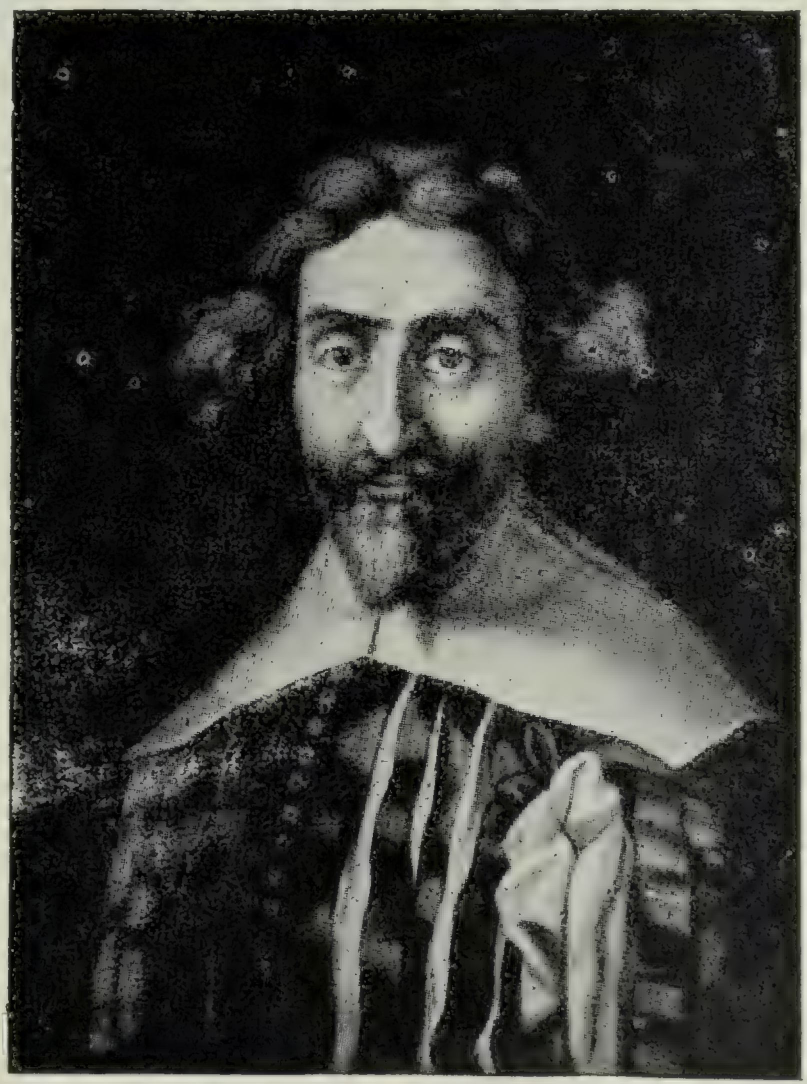
FOR our next writer we must journey to Spain, to the high central tableland—burning hot in summer, bleak and windswept in winter—in the midst of which lies the capital city of Madrid. To the north-east of Madrid, about seventeen miles away, stands the small provincial town of Alcala. In size Alcala may be inconsiderable, but in one respect it is more important than Madrid itself. For it is the birthplace of the greatest of all Spanish writers, Miguel de Cervantes, who was born there in 1547, seventeen years before Shakespeare.

THE NOVELIST WHO HAD THE SPIRIT OF ADVENTURE IN HIS VEINS.

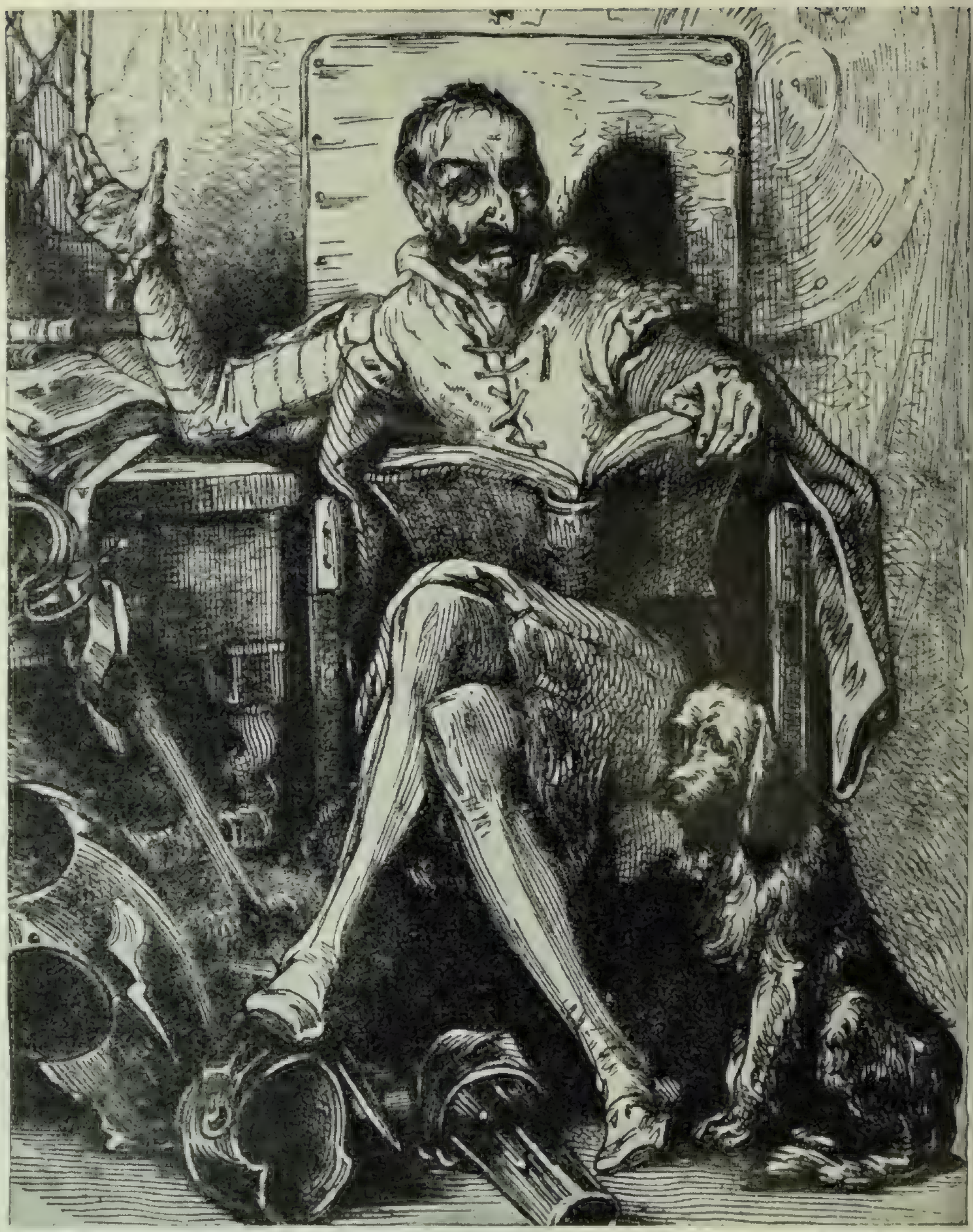
Young Miguel's father, who was a prosperous surgeon in the city, tried hard to make his son a scholar. But the boy was not of a scholarly nature. He had the spirit of adventure in his blood. A life of action, of exploration, and, above all, a life of roaming, appeared to be his choice. The great neighbouring city of Madrid at once drew him into her arms. There, when he was only twenty years of age, he seized the opportunity of enlisting as a soldier and departing on a mission to Rome. Thus early had he satisfied his longings for a life of adventure.

The future novelist was not long in having his heroic desires satisfied still further. War broke out against the Turks, who, at that time, were invading Southern Europe, both by land and sea. A great fleet, supplied by most of the Christian nations of Europe, was assembled at Messina, in Southern Italy. It was commanded by Don John of Austria, the warlike brother of the King of Spain. In that fleet, as a humble soldier, Cervantes set sail on board the galley *Marquesa*, in 1571. As the Christian fleet approached the enemy near Lepanto, Cervantes was stricken with fever, but, in spite of the requests of his comrades, refused to stay below. In the hottest of the action he received three gunshot wounds, two in the chest, and one in his right hand. The wounds in the body turned out to be slight, but that in his right hand maimed him for life. The young soldier had, however, the satisfaction of knowing that in the battle the fleet was routed, and that, for a whole generation, the attacks of the Turks were beaten off from Europe.

Left-handed as he now was, Cervantes was none the less a good soldier still. Other campaigns followed, chiefly in Italy, and in these he acquitted himself well. But he wearied of soldiering. Perhaps already in his mind were stirring these fruitful ideas that were to blossom into his famous books. In 1575 he was granted leave to return to Spain, and so he set out to sail for Naples.



Miguel de Cervantes, the sixteenth century writer, created the famous character, Don Quixote, whose adventures are full of amusement and interest to all readers.



Don Quixote, the hero of Cervantes' famous story, which was read by beggars and Emperors alike. The Don is one of the outstanding figures in literature.

But, like Odysseus, he was to be many years in reaching his home. Off Marseilles, in the south of France, his ship was beset by a fleet of those Barbary pirates whose attacks were the terror of the Mediterranean traders. In the fight that followed Cervantes and his companions were captured and sold into slavery at Algiers in the North of Africa.

For five years he was a slave among the Moors, and the history of those five years is as exciting as the best work of fiction. The maimed soldier was no man to sit quietly in bondage. Time and time again he tried to escape, but every time he was captured and brought back. He was threatened with the most dreadful punishments, including two thousand lashes, and even death itself. But his undaunted spirit refused to submit. Even the Moors admired his courage ; and the Pasha or ruler took Cervantes into his service, declaring that " so long as he had the maimed Spaniard in safe keeping, his Christians, ships, and city were secure." At last, however, in 1570, Cervantes was ransomed for two thousand ducats and so was enabled to return to Spain.

CERVANTES SETTLES DOWN IN MADRID AND TRIES TO MAKE HIS LIVING AS A WRITER.

It is likely that his experiences among the Moors had cured the longing for a life of adventure, for he now settled down in Madrid and tried to make his living as a writer. As is so often the case, he had at first little success, and in 1587 he went to Seville to seek employment in supplying food to the great Armada that set off to invade England in the next year. This task brought him very little money, and he sank into great poverty. It is said that more than once he was imprisoned for debt. To such a pass had his irregular and wandering life led him.

But, when the night was blackest, the dawn was soon to come. While he was in jail at Seville, the idea came to him of the wonderful book that was to bring him fame. It was soon in shape, and in 1605 the immortal romance of *Don Quixote* saw the light of day. It was an instant success. Many editions were printed ; and soon everybody in Spain, from the Emperor to the muleteer, was laughing at the adventures of the crazy knight. Ten years later appeared the second part of the same story, even better than the first. On 23rd April, 1616, the author, now a famous man, died on exactly the same day as did Shakespeare.

THE CRAZY KNIGHT SETS OUT ON ADVENTURES THAT HAVE AMUSED THE WORLD.

Everybody has read about Don Quixote, the crazy knight of La Mancha, which is a small Spanish province. The knight had read so many old-fashioned romances about knight-errants that he set out to imitate them, though they had disappeared ages ago. He equips himself with a suit of rusty armour ;

he finds a broken-down horse which he calls Rosinante; he persuades a peasant, Sancho Panza, to come with him as his squire; and he invents a lady-love, Dulcinea del Toboso, out of a plain country lass who hardly knows of him at all. Thus furnished, he sets off on a series of ludicrous adventures. The best-known is, perhaps, that in which he imagines that some windmills are giants brandishing their arms at him. Under this delusion he heroically attacks the windmills, with disastrous results to himself.

It is easy to laugh at Don Quixote, but that is not enough. Cervantes is a great humorist, but, like all great humorists, he has a vein of deep seriousness. The old Don is, no doubt, a crack-brained dreamer. But he is, also, a noble-minded gentleman, of dauntless courage and of the highest ideals. No matter how often he is cudgelled, persecuted, and laughed at, he steadfastly pursues his aims of helping the oppressed. In the end he succeeds in winning our sincere admiration and respect. The story of his death, when he returns home, a broken man, and dies with his eyes opened to the extent of his recent folly, is great tragedy.

It is these elements, and not the uproarious farce of the comic adventures, that make *Don Quixote* really a great book. Those who read the story of Cervantes should keep the better qualities in mind; in this way enjoyment will be increased, not lessened, and a true judgment of the book will be assured.

MOLIÈRE, PLAYWRIGHT OF FRANCE

WE are now bound for France, which we have not visited for nearly a thousand years, when we heard the deathless Song of Roland. We are going, moreover, to Paris itself, the beautiful capital of France. And having come to Paris we must proceed to the famous Rue St. Honoré, where was born in January, 1622, the play-writer who is the finest that France has produced.

It is worth noticing that the name at the head of this article is not the playwright's real name, which was Jean Baptiste Poquelin. Being an actor, he adopted a stage-name, as most actors do. The name he chose was Molière, and it is by this name that he has come to be universally known.

MOLIÈRE FOUND THE ROAD TO SUCCESS VERY LONG AND HARD.

Like so many other successful writers, Molière began by being a lawyer. But the study of dusty old law-books did not appeal to him. The study of mankind was always his delight. By studying the moods and actions of his fellowmen, and recreating them upon the stage, he became a successful actor; and by recording them in plays of surpassing wit and wisdom, he set himself high in the annals of the world's literature.

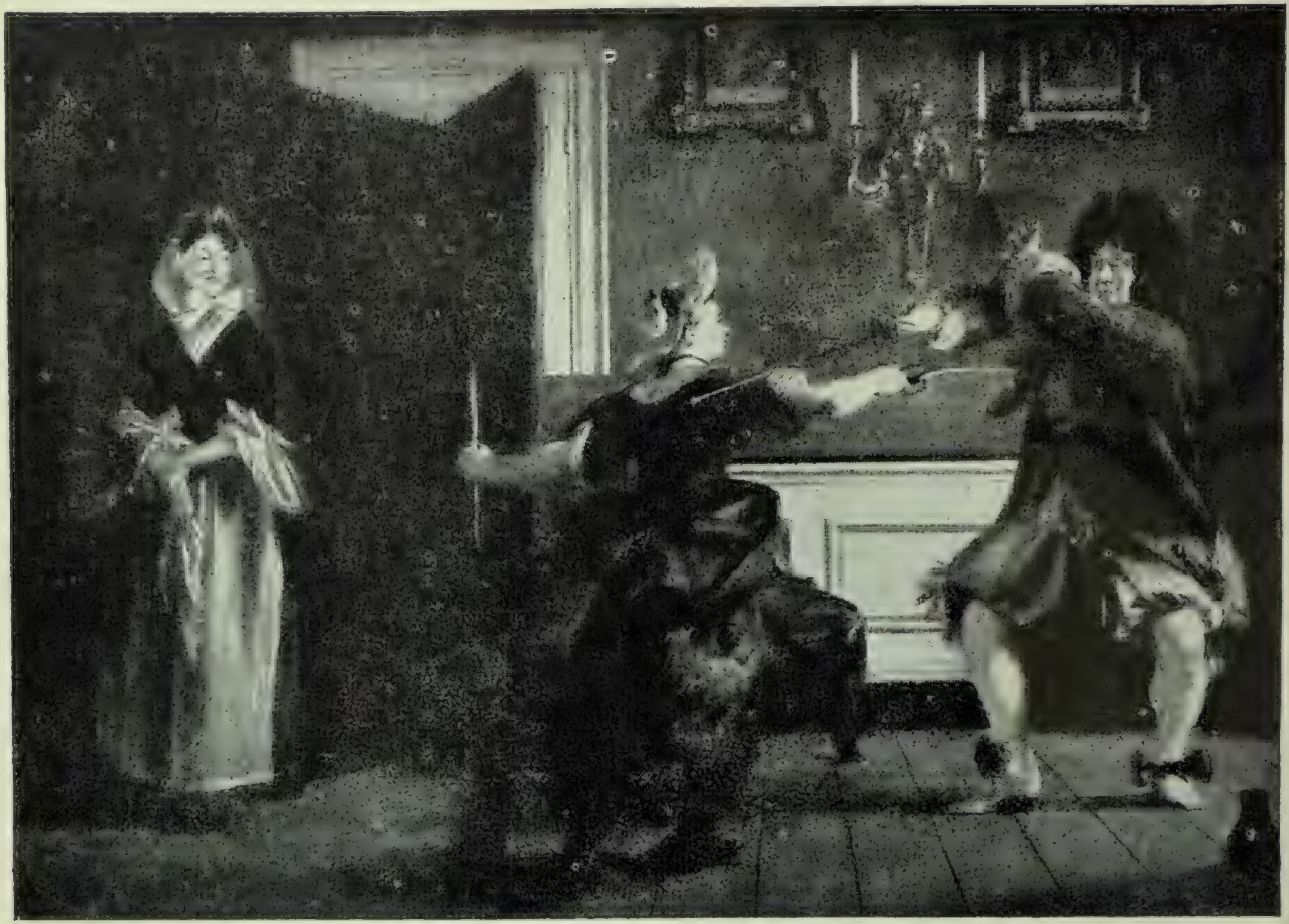
But the road to success is apt to be long and hard, as Molière was to find out. He began in a humble way. Along with some friends he hired a tennis-court in Paris, and fitted it out as a theatre. Molière was manager, but times were hard. Still they struggled along for some time, finding encouragement in the present of the cast-off wardrobe of the Duke of Guise. At one time Molière was unable to pay the bill of the candle-maker. He was arrested, and his friends had to scrape up money enough to set him free.

MOLIÈRE JOINS A GROUP OF STROLLING PLAYERS AND LEARNS THE ART OF THE DRAMATIST.

At last the tennis-court venture collapsed, and Molière took his company on tour (1646). Like Shakespeare, he experienced the ups and downs of the life of the strolling player. The life, though hard, was stimulating. The troupe moved in a long lumbering procession of horses, mules and carts. Any place was made to serve as a stage, and any inn served as accommodation. The stage itself was lighted with feeble tallow-candles stuck in front or at the sides; or sometimes the stage-fittings rose to the luxury of a chandelier of four candlesticks, which was suspended from the roof. During the performance the chandelier was lowered at the end of a rope so that the actors could snuff the candles with their fingers. Under rude conditions such as these Molière, again like Shakespeare, well and truly learned the art of the dramatist; when the time was ripe he was to put his learning into practice.

MOLIÈRE RISES TO FAME AND OPENS A THEATRE AT THE LOUVRE.

Like every other ambitious French actor, Molière longed to return to Paris. There lay fame and fortune, if only he could find a footing there. But a theatre in Paris meant the expenditure of much money, and the manager of a company of poor strolling players had no such means. Another method was to obtain the friendship of a great nobleman, who would support them with his name, his recommendation, and perhaps his wealth. At last, after



An amusing scene from *Le Bourgeois Gentilhomme*, by Molière, the clever French playwright, who was once a member of a band of strolling players. He introduced wit and gaiety into the theatre and delighted French audiences with his brilliance. Later, he rose to be a great dramatic author and the friend of Louis XIV.

repeated efforts, Molière's chance came. In 1658 he obtained the patronage of King Louis XIV.'s brother, who recommended him to the king himself. And in that happy year Molière opened a theatre in the royal palace of the Louvre. Henceforward, he wandered no more. He was now to experience the troubles and the pleasures, not of a strolling player, but of the successful manager and playwright. He was to suffer under the jealousies, the lies, and the back-biting of his less successful competitors ; he was to rejoice over the applause and the pleasure of his fellow-countrymen, but he was to wander no more.

MOLIÈRE SNEERED AT FOOLS AND FOUND MANY ENEMIES.

He made many enemies. For his experience of life had led him to see deeply into the follies and weaknesses of his fellowmen, and these he attacked with an unsparing hand. The weapon he used was the deadliest, particularly among Frenchmen, that of laughter. Vain people, shallow people, stupid people, and deceitful people—all were mercilessly befooled. But, amidst all his scorn of the unworthiness of men, he kept undimmed his respect for their better qualities. He sneered at no man's truth, or honesty, or humility. He praised what was praiseworthy. In this he showed himself to be the great writer.

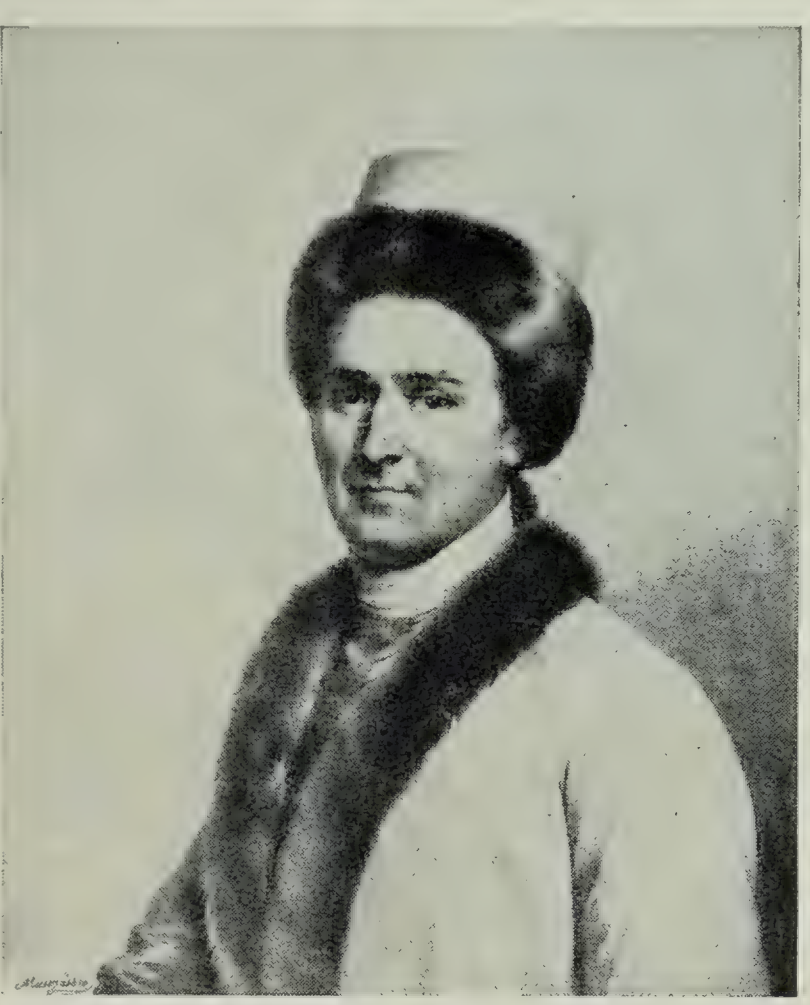
MOLIÈRE'S SPARKLING WIT DRAWS CROWDS TO THE THEATRE.

The benefits he bestowed upon the French stage were priceless. At that time France had other famous play-writers, whose plays are still read and acted with much appreciation. But they were inclined to be too long and heavy. The subjects were classical, drawn chiefly from the stories of Homer and Virgil, and the language was expressed in lines of polished poetry. Now Molière broke away from all this. He chose ordinary people of his own time and class, people with whom every member of his audience would be familiar. His language was the best speech of his own time, sparkling, vivid, full of brilliant wit and humour. French audiences, instead of going to the theatre to be bored, went to enjoy themselves. We can say that Molière transformed the French stage, and through the French stage the entire stage of Europe. And in his plays his spirit is still with us.

JEAN ROUSSEAU AND HIS AUTOBIOGRAPHY

MANY men have written autobiographies, that is, the stories of their own lives, but few have written them in the spirit that inspired Jean Jacques Rousseau, the famous literary man, who was born at Geneva in 1712. In writing it, he set himself to describe *all* the events of his life ; not only his good and worthy actions, such as most men would choose to describe, but also his mean, cowardly, and dishonest actions, such as most writers would shrink from even mentioning. No wonder he called his book his *Confessions*, and its very frankness has placed it high among the great books of the world.

So strange and almost unbelievable are many of the incidents in the *Confessions* that people have suggested that Rousseau, if he were not actually telling lies, must have been at least partly insane. In his early boyhood he could find no suitable occupation, though he tried several, so he cut himself adrift and went on his travels. Among many other jobs, he became a footman. He could keep no situation, however humble, very long, on account of his laziness and self-conceit. His troubles were increased by his continual ill-health, though he had the useful trick of finding good friends who would rescue him from the scrapes into which he was apt to fall. It was not till 1745, when he was thirty-three years old, that he settled for a time in Paris and began his career as a literary man.


Jean Jacques Rousseau, the French author, wrote many important books, and also the story of his life, in which he makes many interesting confessions. It was he who prepared the way for the French Revolution.

HOW ROUSSEAU WON A PRIZE THAT MADE HIM FAMOUS.

By reason of his flighty, erratic nature, Rousseau was incapable of carrying out any prolonged and serious work, but as long as he was interested in any subject, he could write brilliantly upon it. An opportunity came his way when a learned French society offered a prize for an essay on the effect of civilisation upon human nature. Rousseau took a point of view quite different from the usual, by seeming to prove that the savage is much better off than the civilised man. So cleverly was this done that he received the prize, and almost at once he became famous. He actually received an excellent situation under the government, though, as usual, he did not keep it long. He kept quarrelling, too, with the other writers around him, till his name became a byword for craziness and bad temper.

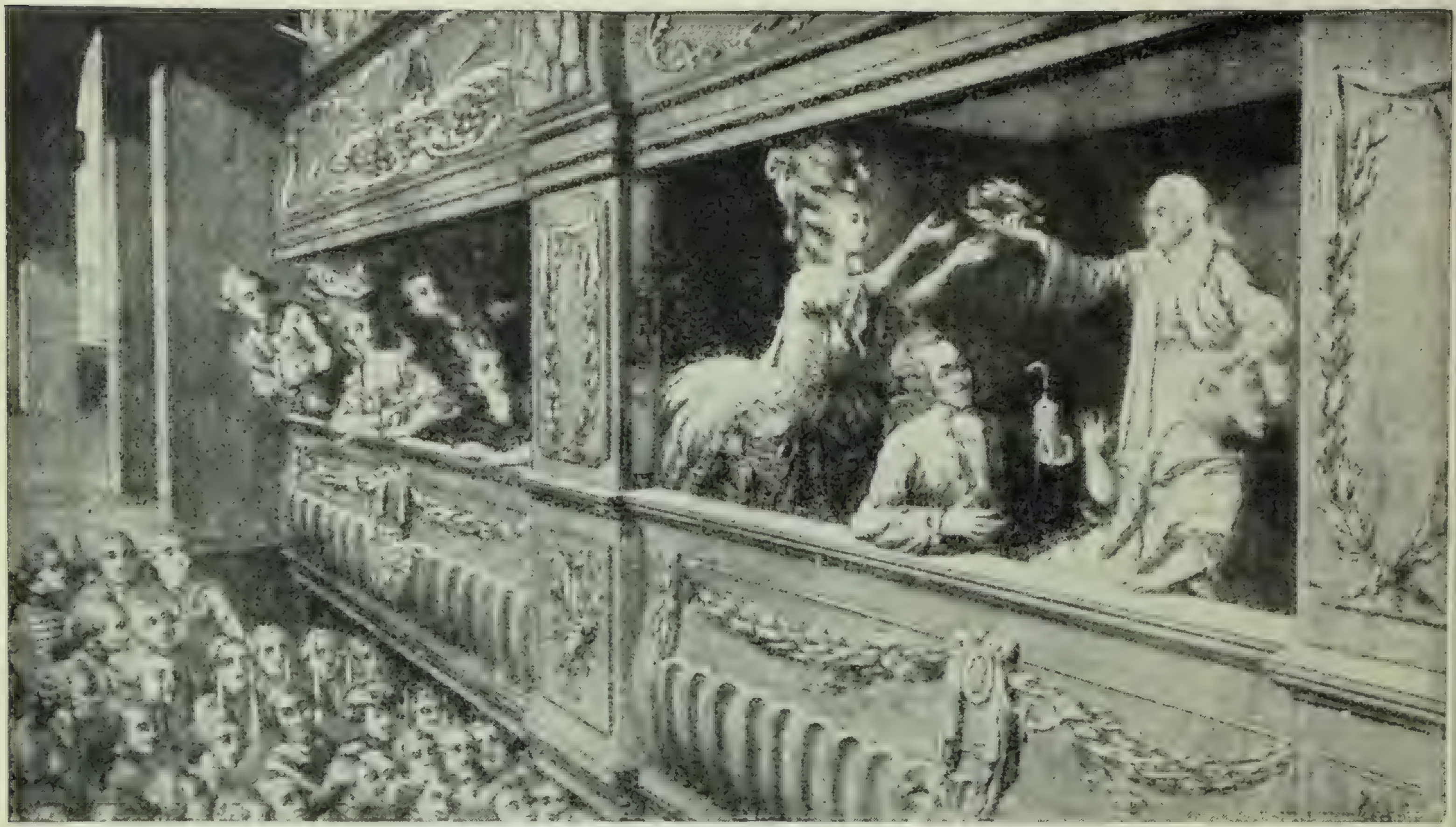
It may be asked here, why do we choose to write about such a foolish man, when so far we have been dealing with great, good and learned men whose books reflect their noble natures ? The answer is this : that Rousseau, in spite of his erratic ways, could and did write splendid books upon important subjects. His influence, too, helped to bring about the most tremendous event of the time, the French Revolution. In many ways, Rousseau laid down the great lines of thought that led up to the Revolution.

ROUSSEAU OPENED THE EYES OF THE FRENCH NATION AND HELPED ON THE REVOLUTION.

For instance, he wrote a book on *The Social Contract*, which set out many of the methods by which a state should be governed. As France was at that time very badly governed, this book opened men's eyes to the reforms which ought to be made. He also wrote a kind of story called *Émile*, which is really a book on new methods of education. Again, as real education in France hardly existed, *Émile* came like a ray of light among the darkness.

For these books, too, he suffered persecution and abuse, which he bore undauntedly. At one time he was driven out of France, and he stayed in England. We must, therefore, respect Rousseau, in spite of his weaknesses, and give him a high place among the great writers of the world.

VOLTAIRE, WHOSE PEN NEVER RESTED



The Marquise de Vilette crowns the famous French writer, Voltaire, in the theatre, after one of his plays had been heard by an admiring audience in Paris. He was a very prolific writer and refused to lay down his pen till his strength gave out. He was especially noted for the purity and elegance of his style in writing, and for his keen thought.

IT is no accident that for the third successive time a French writer takes up our attention. We are now traversing the eighteenth century, a period during which France occupied the leading position in the literature of Europe. This was due partly to the wisdom and energy of her king, Louis XIV., who was called the Grand Monarch, on account of the benefits he conferred on France.

Louis XIV. had an unusually long reign, beginning in 1643 as a child five years old, and finishing in 1715. He thus ruled for seventy-two years, a period during which he raised France to the first position in Europe. Though, as was natural in those days, he thought first of military conquest, he had also the wisdom to see that other things mattered as much. He thus encouraged men of knowledge, of science, and of literature. His military successes did not last even to the end of his reign, but his triumphs in other worthier spheres still adorn his name. He lived to see his son and grandson dead before him, and so in 1715 his great-grandson succeeded as a child of five years old, and was called Louis XV. This monarch reigned for nearly sixty years, so we have the extraordinary fact that two successive reigns covered between them more than a hundred and thirty years. To Louis XV. succeeded Louis XVI., the unfortunate king who perished by the guillotine in 1793, during the blackest years of the French Revolution.

The above historical facts are important in our survey of literature, because they show the approach of the French Revolution, which brought down the ancient structure of France, and which ever since has had a profound effect upon European literature. The wars of Louis XIV. left France poor and discontented ; her troubles increased under the feeble hands of Louis XV.; and finally, a tremendous explosion of popular anger blew the power of Louis XVI. and the system he supported into fragments.

Many famous French writers lent their support to the fast-gathering flood of French discontent. We have seen how Rousseau helped. Now we come to a much greater man and writer, whose blows did much to bring down the fast-crumbling masses of ancient French laws and customs.

We saw that in later life Molière adopted a second name by which he is now generally known. The same is true of Voltaire, though he had not the excuse of Molière, who was an actor. Voltaire's real name was Arouet, and in 1694 he was born of a well-to-do family living in Paris. His father, a lawyer, wished his son to follow him in his profession, but, as often happens, the son would not, or could not, obey. Voltaire, who was a rebel against most things, was also a rebel against his father.

HOW VOLTAIRE CONDEMNED THE FRENCH FOR THEIR WICKED DOINGS.

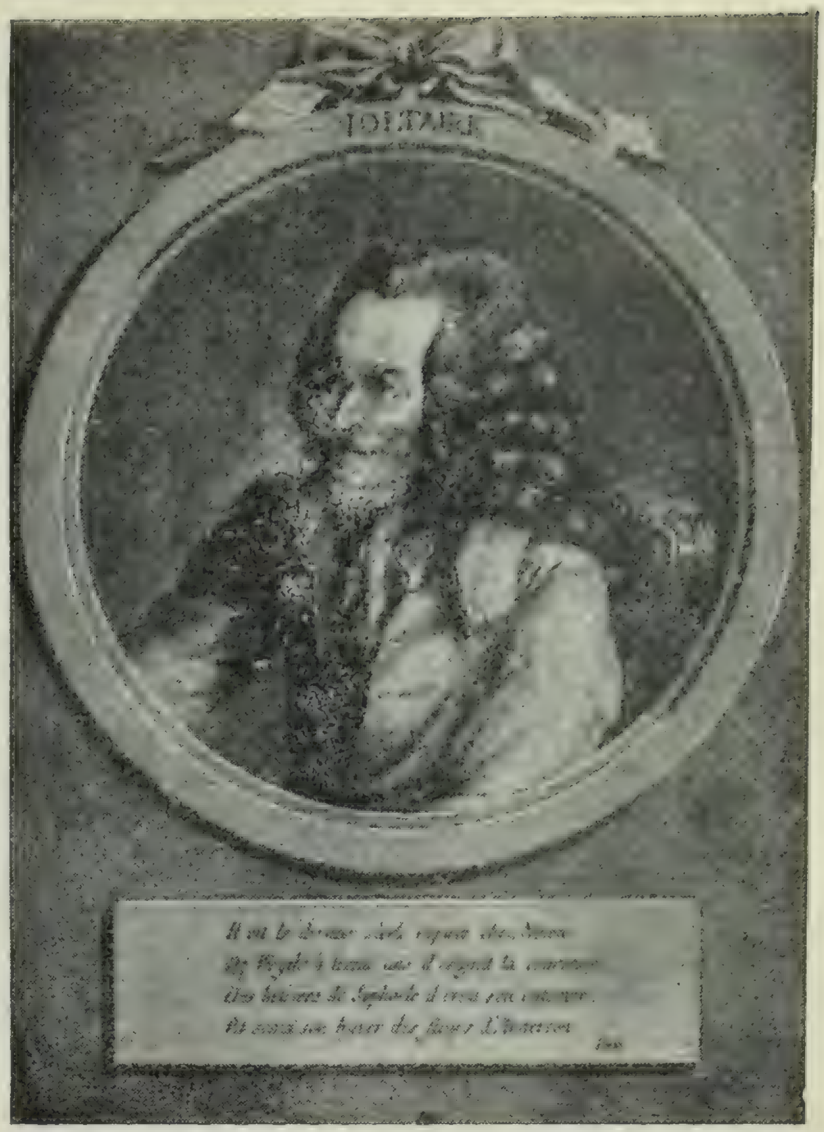
All his life Voltaire was a rebel against the state of things as they then existed. We have seen how much the condition of France justified him in his attitude. It is, therefore, to his credit that, while so many well-off people like himself were content to let things slide, he persisted in carrying on a ceaseless warfare against the injustices that swarmed around him.

Public affairs in France were corrupt and dishonest. To take two examples, the taxes were dishonestly collected, and also, people were often put in prison without a trial. Voltaire courageously exposed such abuses. Many priests, too, had become lazy and ignorant. Voltaire therefore attacked the vices that flourished in religion. His pen never rested ; his manner of writing was brilliant and destructive ; and he knew, better than any other Frenchman, how to hold evil things up to unsparing laughter.

Such conduct was bound to make Voltaire many powerful enemies. They paid him back by putting him in the Bastille, the prison in Paris which was destroyed by the mob during the French Revolution. Even the Bastille did not cool his courage, so his enemies resorted to driving him out of France. His long life is therefore little more than a record of exiles in various parts of Europe. Like Rousseau, he came to England and there he spent three years (1726-1729), during which time he became a popular hero. He afterwards stayed in Lorraine, then an independent state ; and for over a year he dwelt in Berlin as the guest of Frederick the Great of Prussia.

VOLTAIRE, THE FEARLESS WRITER, IS DRIVEN OUT OF ANOTHER COUNTRY.

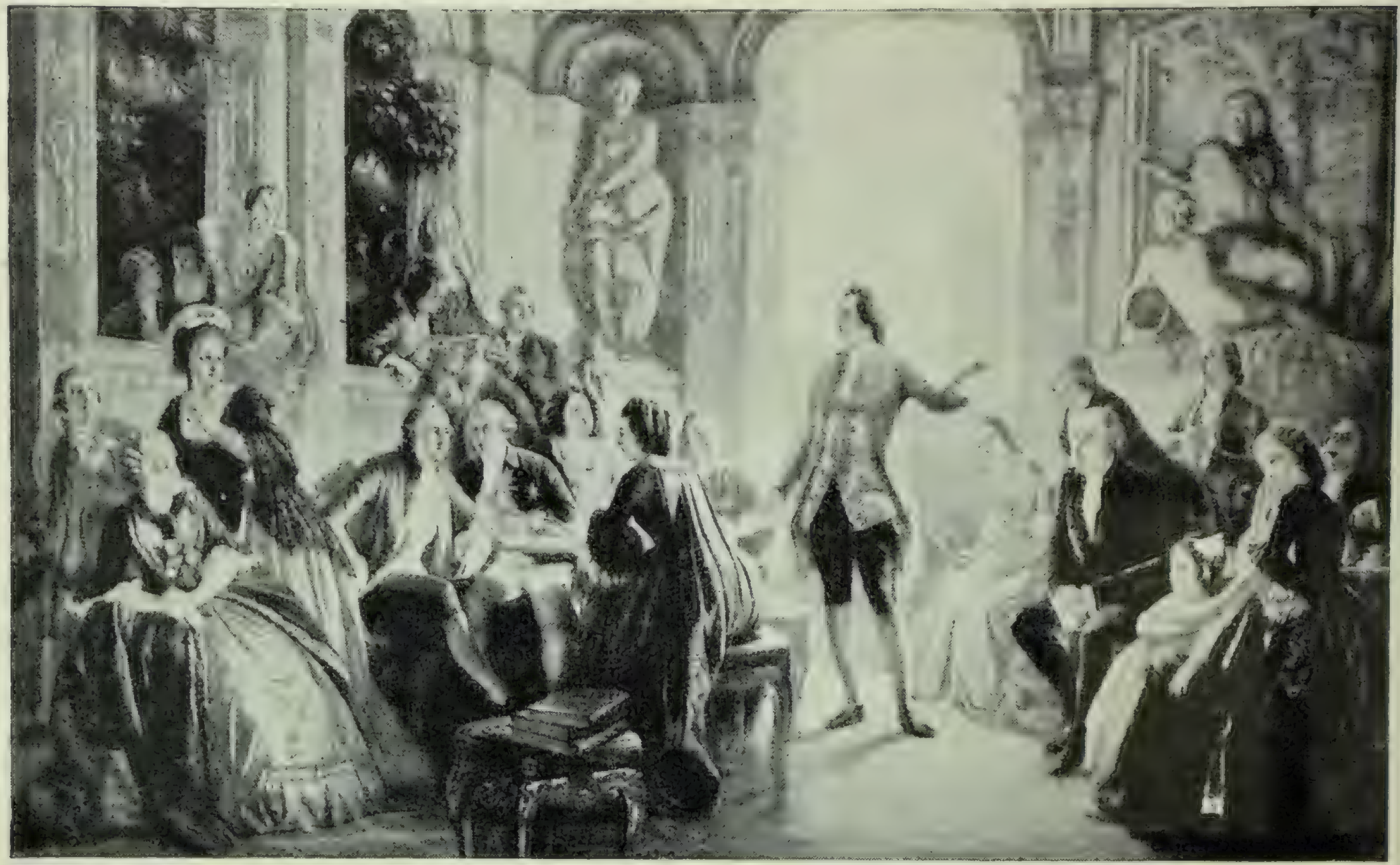
Voltaire's visit to Frederick was an extraordinary affair. The Prussian King had long been anxious to follow in the footsteps of Louis XIV., and so to raise his Prussian kingdom to the eminence to which Louis had raised France. As one way of doing this, Frederick invited Voltaire, whom France had expelled, to live with him as his guest in Berlin. At first their relations were very cordial. But neither of the two men was easily pleased. Frederick was haughty and tyrannical ; Voltaire, when he chose to be so, could be mean and treacherous. Voltaire was jealous, too, of the Germans around him, and sneered at them. After little more than a year at Berlin, he quarrelled furiously with Frederick, who actually had him arrested. Voltaire was glad to leave Prussia, and afterwards he was always sorry he had ever seen Berlin.



François Marie Arouet de Voltaire—the author, playwright and philosopher, who was not afraid to ridicule the evil doings of his countrymen. He was imprisoned in the Bastille by his enemies and driven out of France. He returned, however, to live near Lake Geneva.

In spite of his troubles, Voltaire amassed a large fortune, and lived to the ripe old age of eighty-four. His latter years were spent on the shores of Lake Geneva, at a place called Ferney. Like Sir Walter Scott, he loved to pass as a country squire, and gathered about him an extensive household. He did not cease to write, however ; and from his home at Ferney a constant stream of books, plays, and pamphlets issued to delight and instruct the literary world. It is pleasing to record that his very last days were soothed with the public applause of his countrymen. His play of *Irene* was presented in Paris, and Voltaire, who occupied a box in the theatre, was given a tremendous ovation. The strain of the long journey to Paris, and the excitement of his play's success, were too much for a man of his advanced years. He was taken seriously ill, and though he partly recovered, he was too weak to be moved from Paris. With his usual courage, he set about composing another tragedy, but within a few weeks he was dead. Thus perished one of the bravest writers of France.

GOETHE, A MANY-SIDED POET



A picture of Goethe, the clever German poet, reciting some of his poems at the court of Charles Frederick of Baden. His most famous work is the fascinating story of *Faust*, which tells of a man who sold his soul to the Devil.

IN quest of world literature we are now approaching the nineteenth century, and for the first time we come upon a German writer. Nowadays Germany is included among the first-class European nations, both in literature and in most other respects, but she has been slow in attaining to this standard. For a long time she was a divided country, and open to the attacks of her watchful and warlike neighbours. This kept her weak and backward. Her language, too, was a collection of dialects, which prevented literature from reaching a high standard. It was quite late in the nineteenth century before the many German states began to draw together and combine, and so to form a powerful member of the company of European nations. A literary language was also adopted, and so the literature of Germany began to take a very high place among the literature of other nations. Even before this happened, however, she was to produce a writer whose excellence made him worthy of any company. His name was Goethe.

It is interesting to note that, as a sidelight on the divided condition of Germany in his day, the most esteemed of all German poets had hardly any connection with Berlin, the city which is now the centre of German art and literature. Goethe was born in Frankfurt-on-Main, an ancient and wealthy city near the great River Rhine. The young poet himself gives a charming description of the quaint old rambling house in which he was born in 1749, and especially of the toy theatre by which his early dramatic instincts were awakened. Later, he went to study law at Leipzig, a famous city in the kingdom of Saxony; and later still he went to Strasburg, a university town in Alsace, which the French had taken from the Germans, but which the Germans still regarded as their own. Here Goethe pursued his studies with intense enthusiasm, and gained a knowledge, not only of law, but of art, science, and other branches of knowledge.

Like the Scottish poet, Robert Burns, Goethe had the habit of becoming very fond of particular people, both men and women, and of expressing his feelings towards them in the form of beautiful poetry. In most cases his friendships did not last long, but while they did last they were felt very deeply. It is this habit of feeling deeply and expressing beautifully that makes great poets and great poetry, and so we ought to feel thankful to those friends of Goethe who inspired him to write his verses. His best songs, like those of Robert Burns, are ranked among the finest of any language. One of the most beautiful love-stories in the literature of the world is revealed in the series of songs he wrote about Frederica, the charming daughter of a village preacher who lived near Strasburg. As a young and happy student Goethe met and loved Frederica, but alas! he could not marry her, and this romance withered away. He lived to be an old man, and many friendships intervened between him and his youthful love, but he never forgot Frederica.

HOW FAUST SELLS HIS SOUL TO THE DEVIL SO THAT HE MIGHT REGAIN HIS YOUTH.

Goethe is justly considered to be a great poet, but he himself looked upon poetry as only one side of his many activities. When he was only twenty-five he gained the friendship of the Duke of the small but wealthy German State of Weimar. The friendship between the poet and the nobleman resulted in an invitation to the poet to come to Weimar and become the Duke's Prime Minister. Goethe accepted the invitation, and he made an excellent minister. He studied agriculture, coal-mining, and other industries, and showed himself thoroughly capable of dealing with such subjects. To the end of his life Goethe lived, with intervals due chiefly to travels abroad, in Weimar, and there his bones received honourable burial.

Besides acting as a successful statesman, Goethe was deeply interested in science. He actually wrote learned books on the subject of light and colour, and on the construction of the earth. His scientific ideas are now long out of date, and have been forgotten, but they are worth mentioning as showing how active and comprehensive his mind was. He also wrote freely on art and the theatre, and was always ready to discuss and adopt new ideas in these branches of art.

Goethe lived to be eighty-three, nearly as old as Voltaire; and during his long life he wrote constantly, both in prose and verse. He composed novels, which are still held in the highest regard; he wrote plays, which are considered to be among the best in his language; and of course his songs are among the finest in any language. But the poem by which he is generally esteemed, and to which his name is always linked, is the drama of *Faust.* No more surely is Virgil's name linked with the *Aeneid,* or Dante's with *The Divine Comedy,* than is Goethe's with *Faust.*

The story of *Faust* is an old one—so old that many different versions exist, none of which can claim to be the correct one. The idea underlying all the stories of *Faust* is, however, the same. Faust is a very learned man, almost a magician, and to regain his youth he sells his soul to Mephistopheles, who is usually taken to be the Devil. Faust regains his youth, but at a stated hour Mephistopheles returns and carries Faust's soul away to destruction.

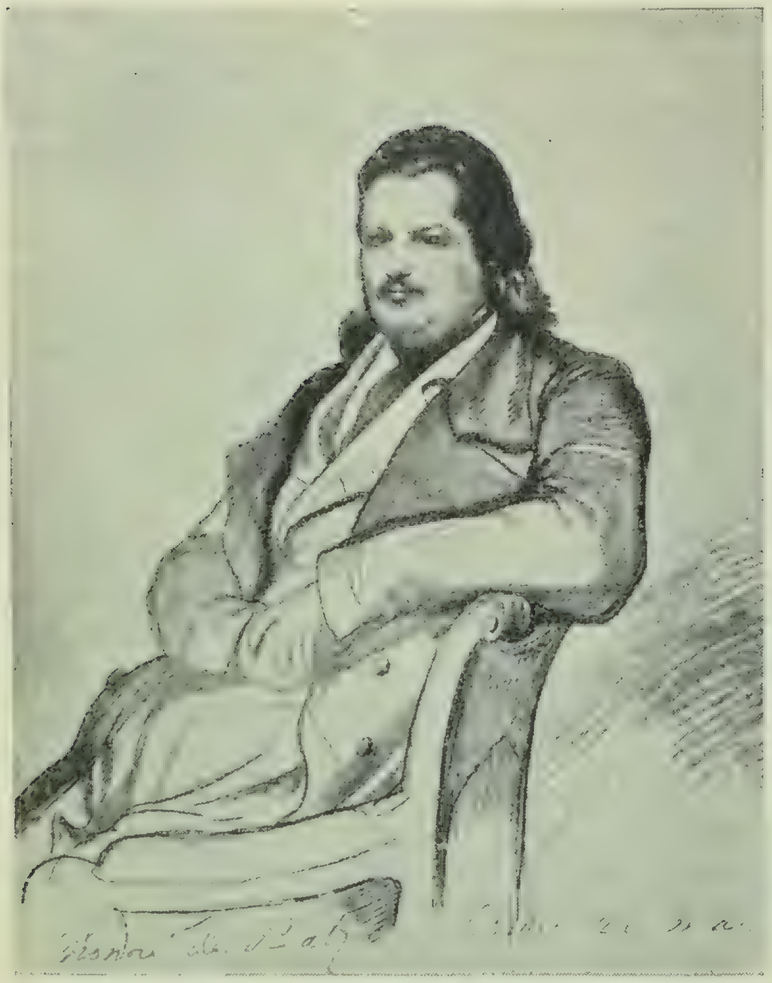
THE GREAT POEM THAT HAS MADE THE NAME OF GOETHE FAMOUS.

In the hands of Goethe this simple story becomes a gigantic poem, upon which he worked during much of his long life. In it he sums up all his own experience, and hopes, and fears. Faust is no longer a man but all Mankind, in whom the joys and sorrows of all mankind are concentrated and find expression. Similarly Mephistopheles becomes the spirit of Evil, seeking to drag Mankind to doom. The poem is supposed to be a drama, but so vast and awful are the scenes that they are quite unsuited to be acted on the stage. The poem stands as the monument to the best elements of the German race, which Goethe himself represented and summed up in his own splendid genius.

BALZAC, THE BUSY FRENCH WRITER

FOR the last time we return to France, and take a brief glance at the most imposing figure among her novelists—the figure of Honoré de Balzac. Among the story writers of all ages and countries no man had a stranger career than Balzac, who was born in the ancient city of Tours, in the year 1799, just when Napoleon had begun his rapid rise to fame.

Like several writers already mentioned, Balzac was at first marked out for a career in the law, but, like so many more, he found that he was by temper quite unsuited to a legal career. His father was a stern man, and insisted, but his son was quite as stubborn, and resisted. Balzac was then just twenty-one years old, and with the new-born consciousness of liberty continued to resist. To bring his son to reason, as he thought, Balzac's father left him penniless in Paris; and for two or three years the young author almost starved in an attic, as he wrote desperately to earn enough money to keep himself alive. It was fortunate for him that his kind-hearted sister Laura



Honoré de Balzac has been called the Dickens of France. He was an untiring writer, often working sixteen hours at a stretch on his big task of "The Human Comedy."

could help him both with money and advice, for he badly needed both. Balzac was always willing enough to take or borrow money, but his wayward spirit always made him refuse or neglect good advice. If his habits in these respects had only been reversed, he would have led an easier and happier life.

BALZAC WORKED NIGHT AND DAY, WRITING MANY NOVELS AND DRAMAS.

Like Sir Walter Scott, the famous Scottish author, Balzac had the idea that he would succeed in a business career, but, again, like Scott, he found to his cost that he had been mistaken. He started, for instance, in business as a type founder, and lost nearly all his money in it. He did not actually ruin himself, as did Scott, but he was continually in debt; and his career in business consisted of a long series of efforts by which he got rid of old debts only to bring on new ones. More important from the literary point of view, these business dealings of Balzac led him to use up his time and energy in a useless manner when all his attention should have been devoted to his real business in life, namely, that of writing the stories which were to bring him fame as well as a great deal of money. It was not till he was nearly thirty years old, however, that his real literary career began.

Once he did begin in earnest, nobody could compare with Balzac in the tremendous energy with which he worked. He could write for sixteen hours at a stretch and keep up the pace of production for weeks at a time. Nothing seemed to tire him, once he was in the mood for writing. Consequently, he poured forth an endless stream of literary works—dramas, stories, pamphlets, newspaper articles, or anything else he fancied at the time. Owing to the great haste in its production, much of this work is of little value, but the best of it is of the highest quality; and he designed his best novels to work into a huge plan which he called "The Human Comedy."

THE AUTHOR WHO WROTE MANY FASCINATING TALES OF PARISIAN LIFE.

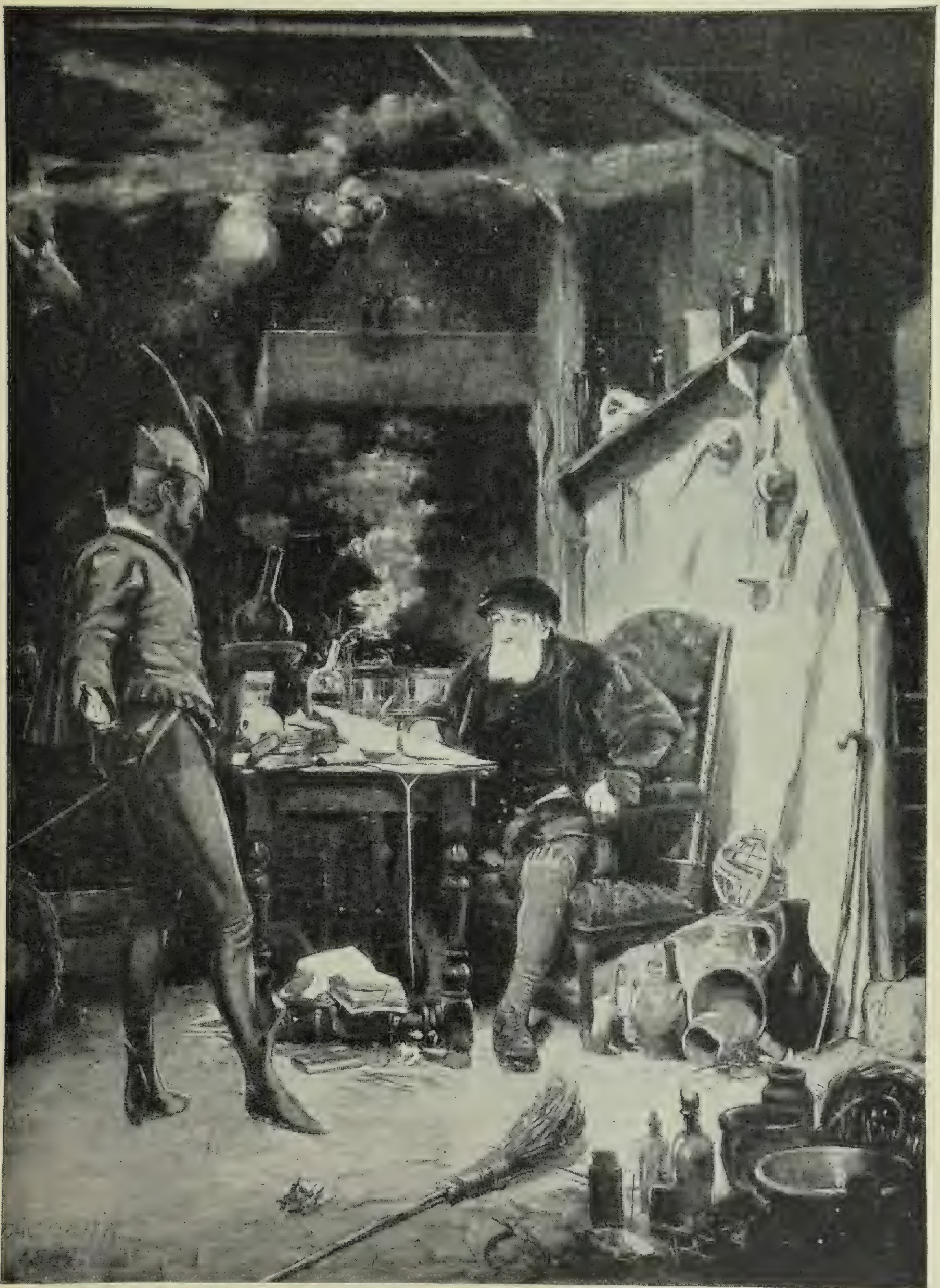
We have seen how Dante wrote his great poem, *The Divine Comedy*, in which he surveyed mankind in the spheres outside the earth. Balzac intended to take up human life on the earth, and treat it in another way, but none the less vigorously and beautifully. He was no more "comic" than was Dante. Balzac's "Comedy" is rather sad and almost depressing, as is the first part of Dante's "Comedy." But both writers had the splendid minds and strong imaginations that were necessary for such a gigantic task.

Balzac intended his work to be chiefly a series of stories dealing with human life, and almost entirely with life in Paris as he knew it. He had seen the bright side of its society, the wickedness of its underworld and the beauty and honesty of its ordinary people's lives. He knew Parisian life very well, because he had passed through nearly every stage of it. Thus we get a number of tales of Parisian life, vividly told and deeply interesting, and all bearing witness to the splendid literary talent of this writer. But he died before his scheme was completed. He left, however, sufficient material to form the grandest and most complete structure of fiction that has yet been devised by any novelist.

SOME OF THE MOST ENTERTAINING OF BALZAC'S MANY NOVELS.

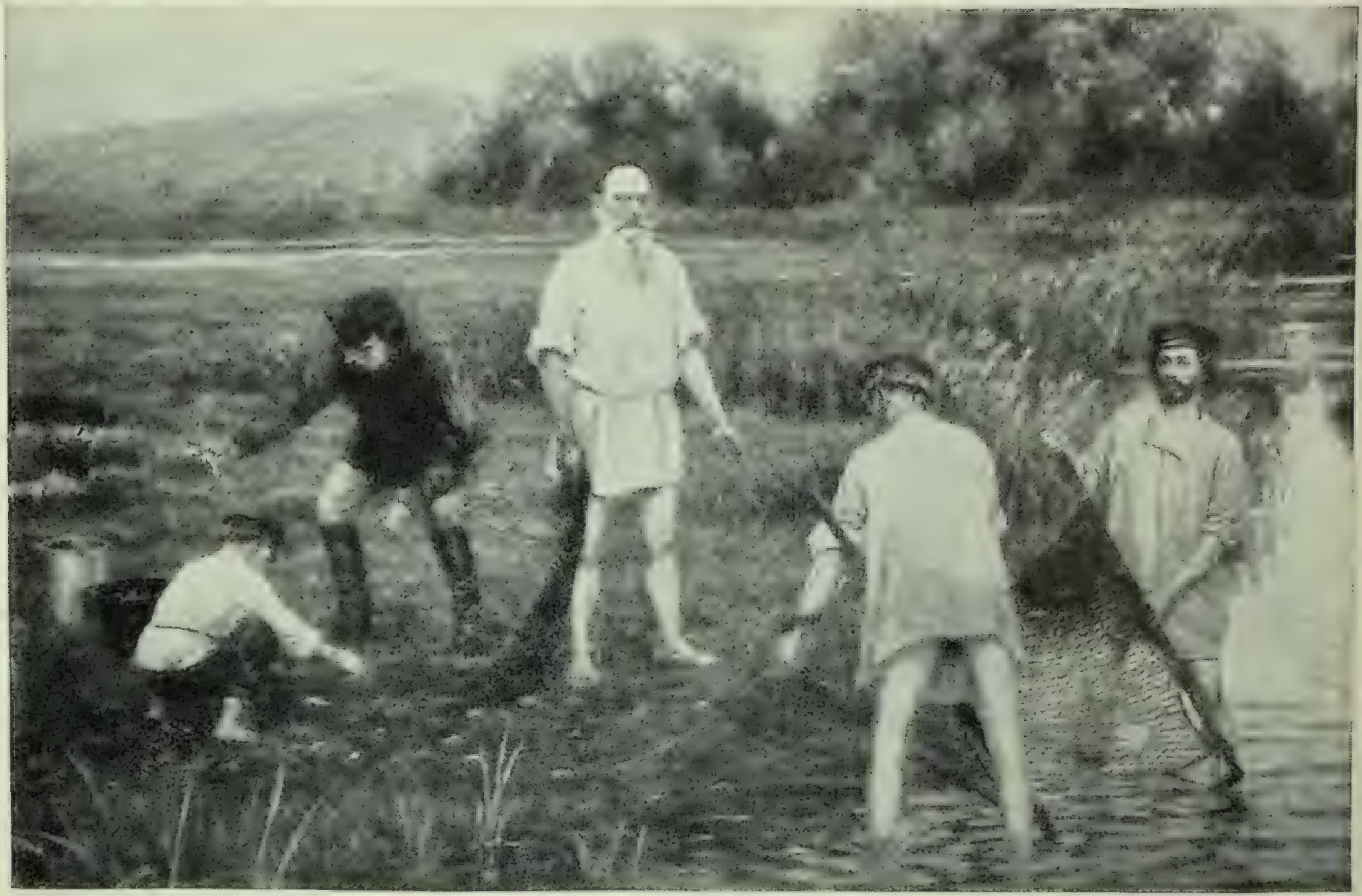
In twenty years he turned out no fewer than eighty-five novels, and therefore it is natural that some of his work was scrappy and unpolished. His best books, however, are gems of writing, and will live long in the world's literature. *The Wild Ass's Skin*, *Eugénie Grandet*, *Father Goriot* and *The Chouans* are among his most famous stories.

THE MAN WHO SOLD HIS SOUL TO SATAN



In Goethe's world-famous poem, *Faust*, there is an interesting story that fascinates every reader. It tells how Faust, in an endeavour to regain his youth, is persuaded to sell his soul to Mephistopheles, who is seen in the picture.

TOLSTOY, THE AUTHOR AND NOBLEMAN



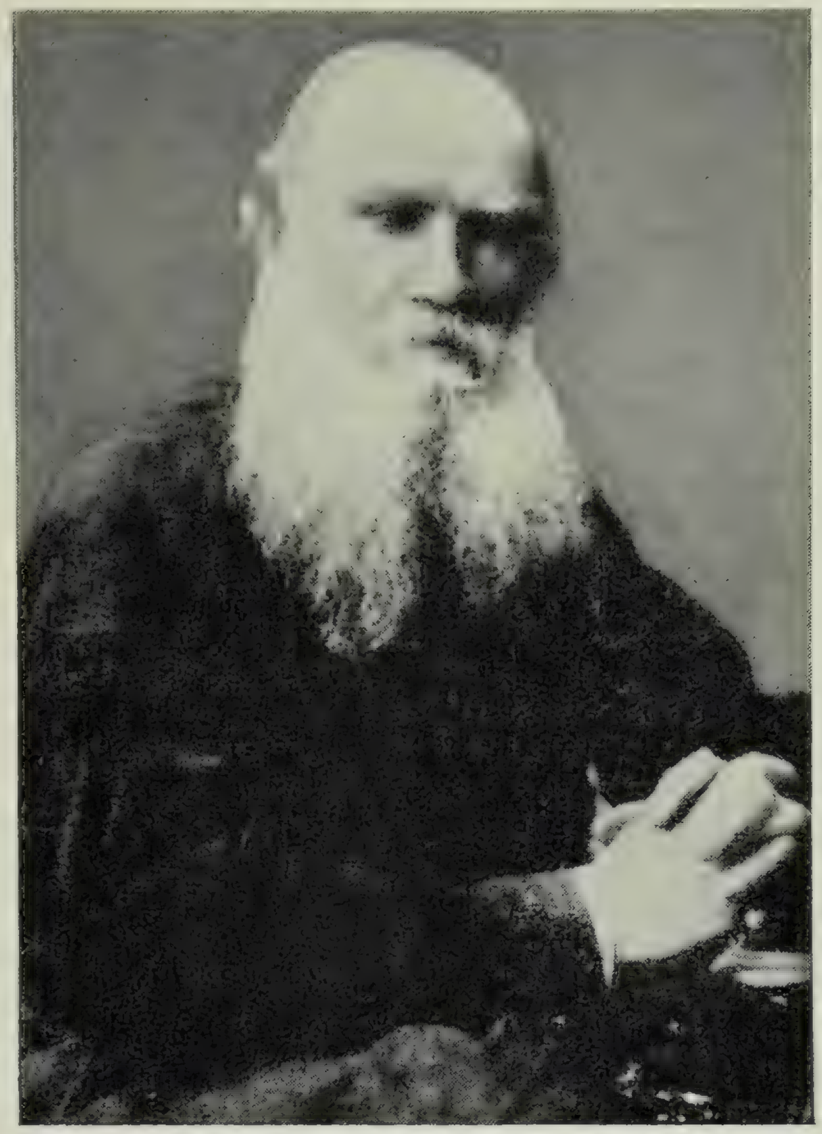
Although a nobleman, Tolstoy liked to dress like a peasant and mingle with the poor people. We see him above as a fisherman—from a painting by the famous Russian artist, M. Répin, who is on the extreme right of the picture. [*E.N.A.*

NOW at last, in our long journey, we come to Russia. In doing so, we come almost to the end of our travels, which shows how late Russia was in attaining to world-wide importance in literature. It was, in fact, rather late in the nineteenth century before Russian literature began to take shape and gather real importance. The harvest, though late, soon showed itself to be rich and splendid. And of all the famous Russian writers, the finest is Count Leo Tolstoy.

Within the last few pages we have had to deal with several extraordinary men, but none of these can surpass Tolstoy in sheer originality of mind and character. In nearly every way he was an extraordinary man. Both in himself and in his career he was full of contradictions. He was particularly fond of beautiful things, and yet he himself was so ugly that when he was a boy he was ashamed to look at his own reflection in the mirror. He was also a man of peace, hating war and cruelty of all kinds, and yet he was by profession a soldier, and saw the horrors of the dreadful Crimean War. Besides, he was a nobleman, born into the idle, wealthy, selfish class of Russians who at that time misruled the poor peasants of their great country; and yet all his sympathies lay with the poor and the oppressed. He was actually a man of his hands, an active manual worker who delighted in mowing a meadow or in making shoes, and yet he was compelled either to live in idleness or take to the inactive life of writing books. These and other contradictions in Tolstoy account for the strange conduct of the foremost of all Russian writers.

The truth was, that Tolstoy was a misfit. He was born in the wrong time and place, and only with difficulty could he adapt himself to the conditions around him. As he grew older, these conditions became unbearable, and he rebelled. He has himself left us a very careful account of his youthful experiences in a book that closely resembles the *Confessions* of Rousseau, whom Tolstoy admired very much as a writer, and whom he imitated in his own early writings. In his book, which he called *Childhood, Boyhood and Youth*, Tolstoy vividly describes his boyhood on his father's estate at Yasnaya Polyana, near Toula, which is an important city in the south of Russia. The future author was not regarded as a clever child, for he was very quiet and often inattentive; though his tutors and elders did not know of the deep and curious thoughts that were occupying his mind. Later, when he went to the University of Kazan, and donned the student's cap and uniform, he was, he tells us, as idle and extravagant as the worst of his fellow-students. And when he entered the army, as nearly all the young noblemen did in those days, he lived the reckless and extravagant life that was usual among the rich and idle officers around him.

The change in Tolstoy's life came when he saw real warfare, and the horrors that it brought about. Ideas that had long been stirring in his mind came suddenly to the surface and brought about a change in his conduct. He renounced the gay life of courts and capitals, and retired to his estates in Southern Russia. There the condition of his starving peasants deepened the pity he felt for the poor and helpless millions that swarmed in Russia. Indeed, the idea of helping his fellow-men became his religion. He read the Bible closely, and in this Book he saw a clear call to the service of the poor. He opened schools, taught in them, and wrote books for them.


Count Leo Tolstoy, the Russian writer, was careless and extravagant in his youth, but later devoted his life to the welfare of the peasants of his country.

He welcomed with the greatest joy the act of Czar Alexander II., who in 1855 published his decree setting free all the serfs of Russia. Tolstoy became a zealous worker in the administration of the decree, settling numerous difficulties and disputes that arose in the working out of this action of the Czar. Finally, in his old age, Tolstoy gave up his possessions, became a peasant. He dressed like a peasant, and lived like a peasant, became a cobbler and made shoes for the peasants. In this manner he considered himself to be working out the decrees of Jesus Christ, whose words he never ceased to study in the New Testament.

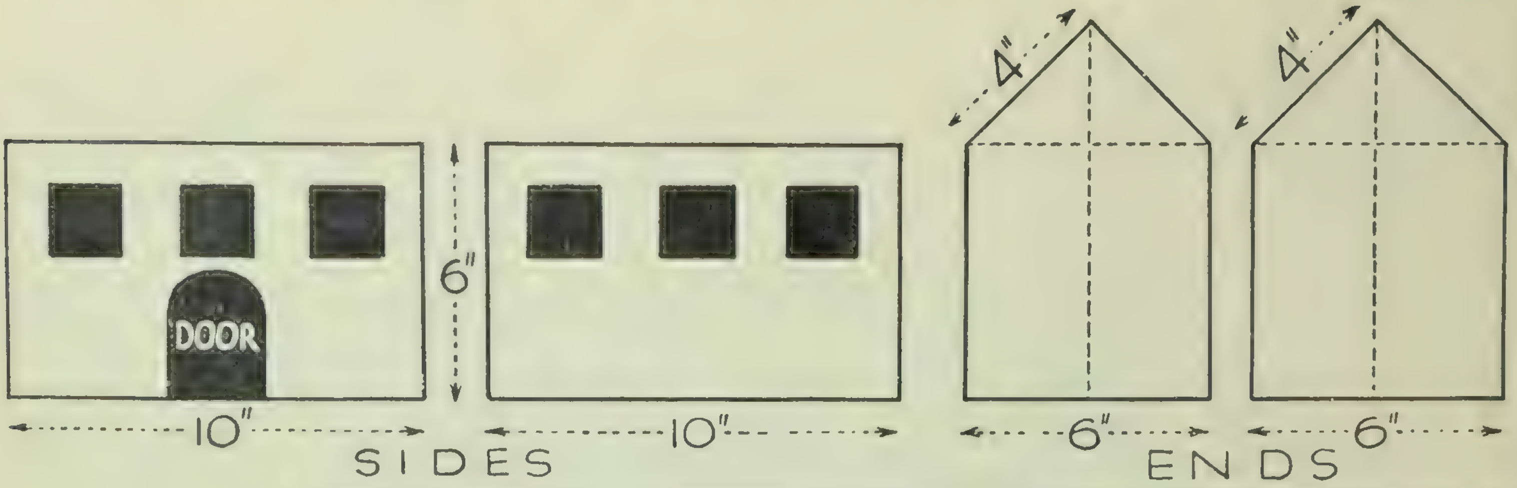
THE STRANGE NOBLEMAN WHO ASTONISHED HIS FRIENDS WITH HIS IDEAS.

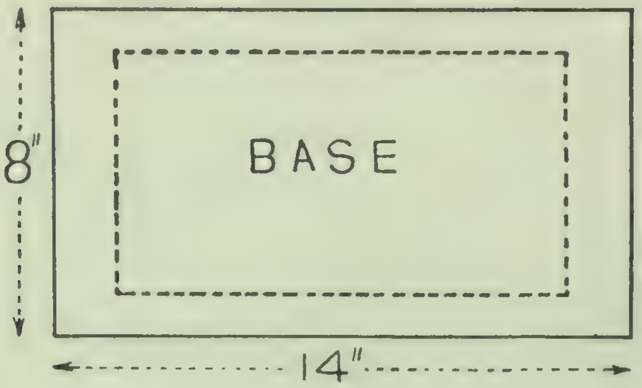
In carrying out his plans to benefit the poor, he found great difficulties. His noble friends laughed and wondered at him. His wife was horrified when he offered to abandon her and their children to poverty. The peasants themselves, who had never before seen such a strange nobleman, were suspicious of the very man who was exerting himself to befriend them. These difficulties, however, did not dismay a man like Tolstoy. In the course of time he overcame them all, and lived to see himself loved and reverenced as a prophet by countless millions of people, not only in Russia, but all over the world. In this way he received the reward that he valued above all others.

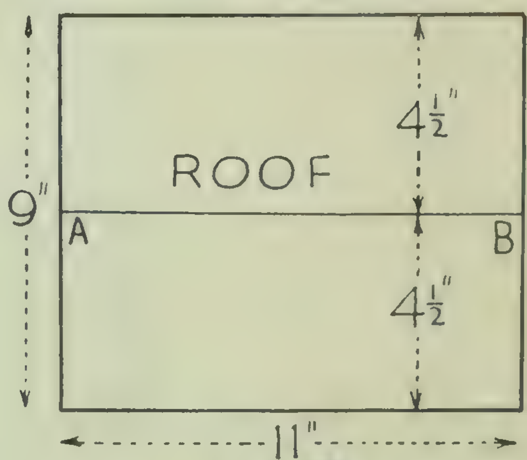
Amidst all these activities Tolstoy kept steadily to his other great purpose in life—that of writing the books that were to make him the most famous writer of the day in Europe. Underlying all his books was the idea of showing up, on the one hand, the evils and weaknesses of the rich and idle class in which he was brought up, and of revealing, on the other hand, the nobility and heroism of the humble folks among whom he latterly cast his lot.

In his finest and longest book, *War and Peace*, we have a long tale of Napoleon's invasion of Russia in 1812. But it is more than a mere story. It is a gigantic picture, faithfully painted by one who knew it, of Russian life and manners, and a fierce condemnation of warfare. In its own way, it is as broad and picturesque a description of human life as is Dante's *Divine Comedy* or Balzac's *Human Comedy*, both of which are ranked among the greatest books of the world.

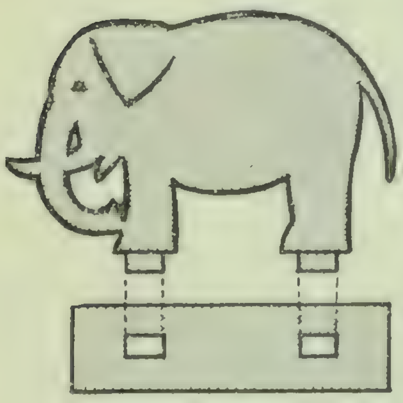
HOW TO MAKE A NOAH'S ARK IN FRETWORK





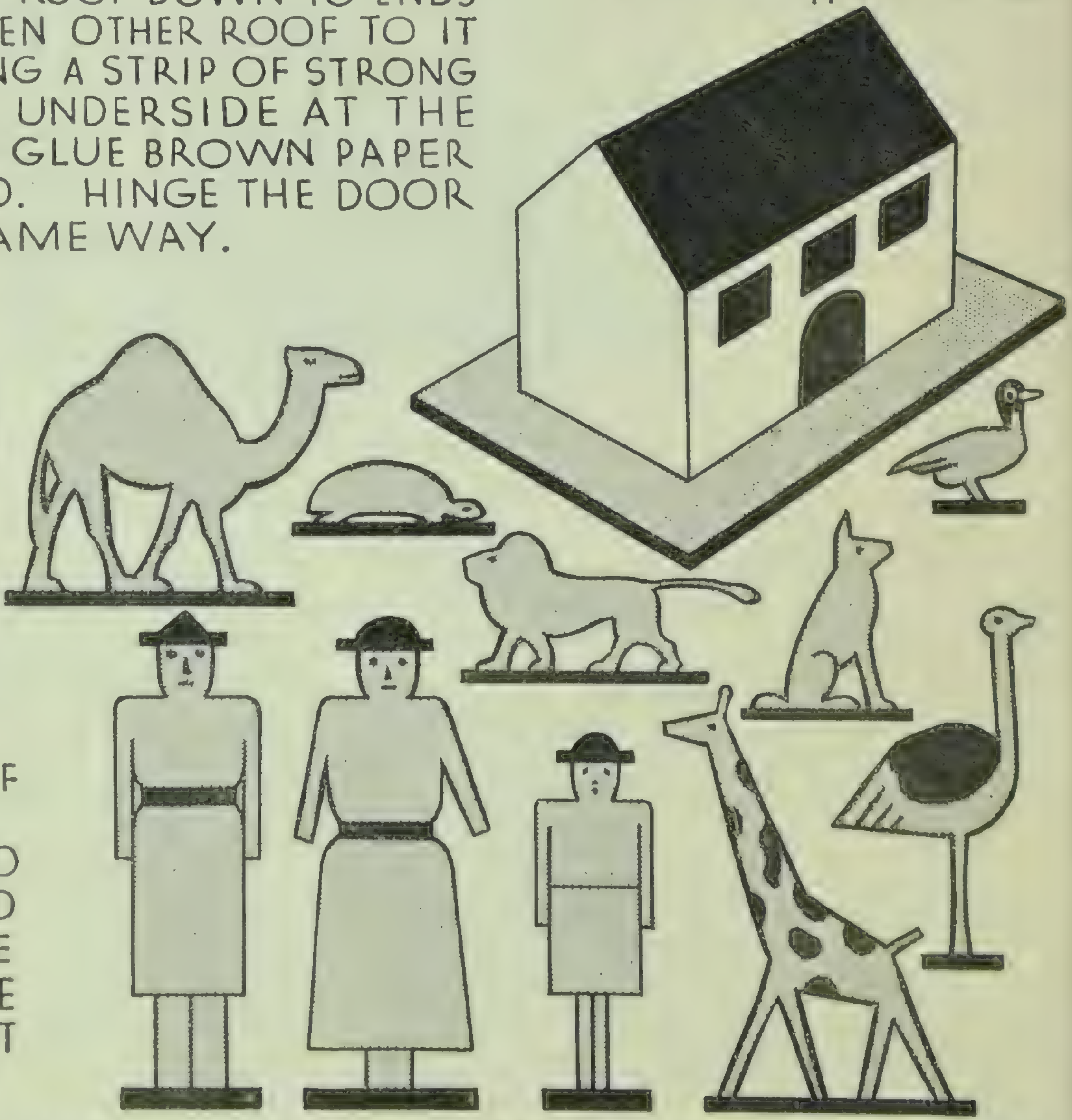


NAIL ONE SIDE OF ROOF DOWN TO ENDS AND SIDE. FASTEN OTHER ROOF TO IT AT AB BY GLUING A STRIP OF STRONG CALICO ON THE UNDERSIDE AT THE JOINING. THEN GLUE BROWN PAPER OVER THE CALICO. HINGE THE DOOR THE SAME WAY.

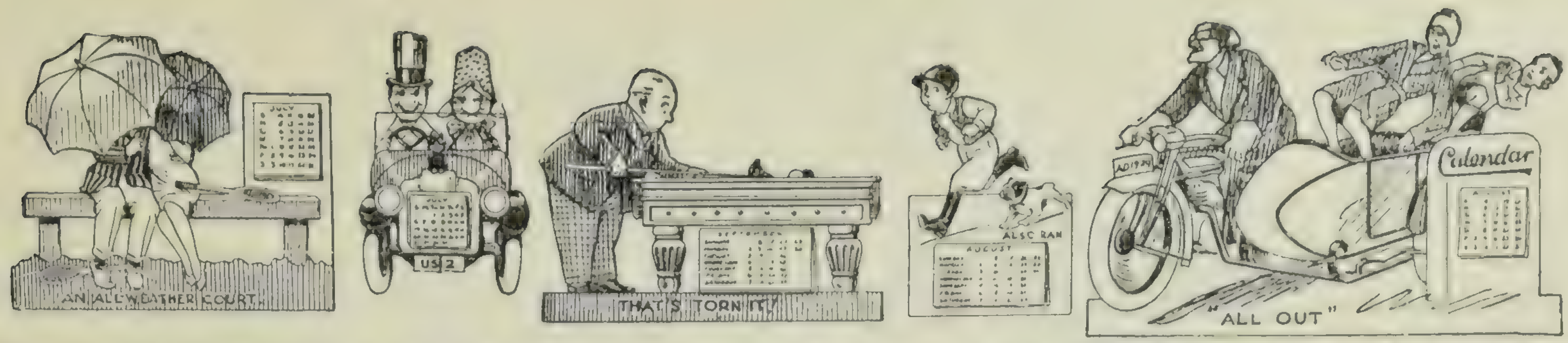


ANIMAL AND BASE

CUT OUT TWO OF EACH ANIMAL. YOU MAY NAIL TWO PIECES OF WOOD TOGETHER, TRACE THE ANIMAL ON THE TOP ONE AND CUT TWO TOGETHER.



When the figures have been cut out and sand-papered, they should be painted carefully. The finished model will make a good present for a small brother or sister, and if care has been taken in making the joints of the animals and bases firm, the toys will stand up to rough usage without breaking.



Neat and attractive calendars can be made with the aid of a fretsaw—and a little patience! How do you like the jolly ones above? They are quite simple to make, as you will learn below. [Hobbies, Ltd.

THE WONDERFUL FRETSAW

What do you do on wet days? Do you stand at the window gazing sulkily at the rain and grumbling because you are bored and have nothing to do? Or do you keep your hands and your brain occupied with some hobby? If so, this section will interest you. You will learn below how to make many useful and fascinating articles with the aid of a fretsaw. You can make Noah's Arks for your own amusement or as Xmas presents for your friends, and all the time find interest and enjoyment for yourself. Try it on the next wet day and you will soon become fascinated with your new hobby and forget to grumble at the weather.

JUST a piece of stick bent like a long-legged letter U, with a handle and a thin saw stretched across the ends of the U. That's all a fretsaw is, but it is a most marvellous tool for boy and girl, man and woman.

Many people associate the fretsaw with fretwork—the making of elaborately cut-out brackets, overmantels, and various knick-knacks for the decoration of the home. But the making of such ornamental pieces of woodwork is only one small use for the clever little saw. Really, every boy and every girl should have a saw and a cutting table, for so many toys and useful things for our comfort and amusement can be made by the aid of this agile tool.

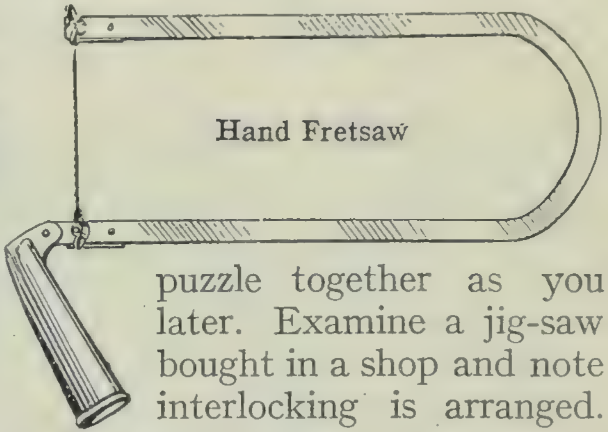
The saw (see col. 2) is held in the hand and the blade is fixed facing away from you, with teeth pointing downwards. The cutting table, clamped to an ordinary table, is used as a steadying influence when sawing the wood.

Three-ply wood, about three-sixteenths of an inch thick, is best for your purpose, as it does not split or play tricks and is very strong. You can buy this wood in sheets at many stores and ironmongers' or joiners' shops.

The saw is moved up and down, a pressure being given to the down stroke, and the wood itself is moved as cutting proceeds. Do not move the saw from side to side. Keep your hand going steadily up and down as a machine, twisting and turning the wood with the hand that holds it down, to allow the saw to follow the pattern drawn or pasted on the wood.

HOW TO MAKE SIMPLE YET FASCINATING JIG-SAW PUZZLES.

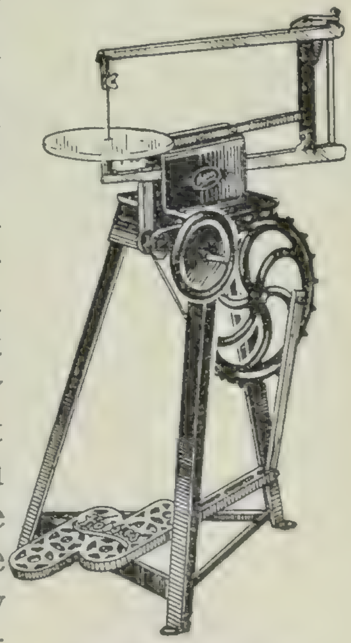
Boys and girls like jig-saw puzzles. With a fretsaw these are simple to make. Just paste your picture on the wood, cut the wood down to the size of the picture, and then commence to saw up the picture into pieces, beginning at one corner. Do not make the pieces too small or too numerous at first. By twisting your wood about endeavour to cut pieces which will lock into others. This keeps the puzzle together as you build it up later. Examine a jig-saw puzzle bought in a shop and note how this interlocking is arranged. When tired of making picture jig-saws, try making a map jig-saw. Cut round the coastline and along county or country boundaries.



Hand Fretsaw

HOW WOULD YOU LIKE TO MAKE A NOAH'S ARK WITH YOUR FRETSAW?

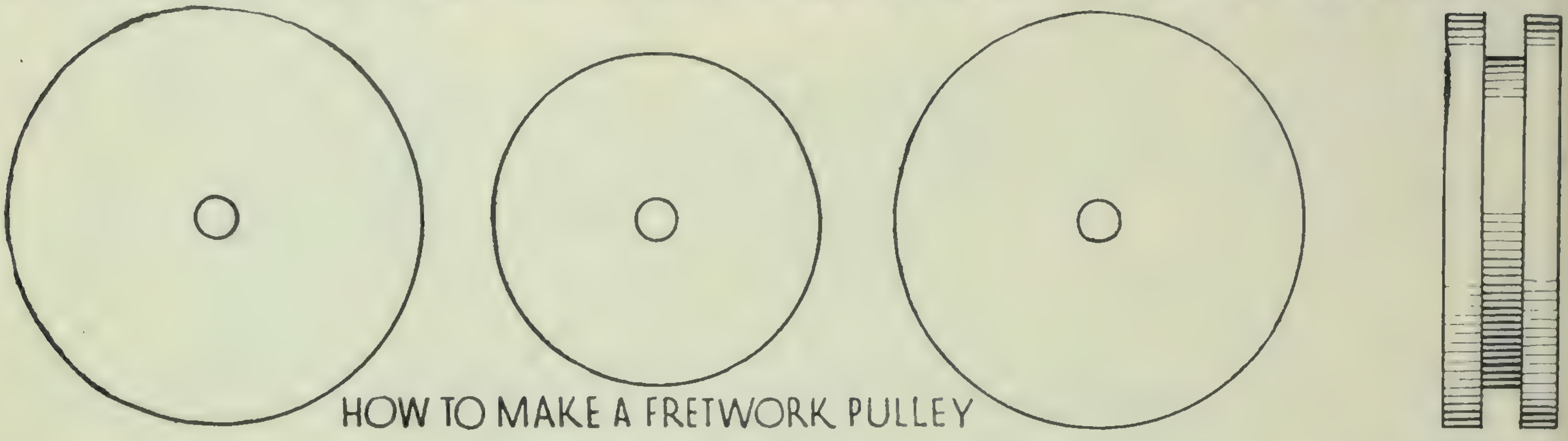
On the opposite page diagrams are given showing you how you may make a Noah's Ark and animals. You may find that, when using good three-ply wood, strips, square pieces or oblong pieces may be cut out from the wood with a sharp, strong knife, guiding the cut by means of a steel ruler or thick, straight piece of wood. Begin by cutting gently and do not apply pressure until you have made sufficient gentle strokes to cut through the first ply of the wood. By this method of sawing you are assured of straight

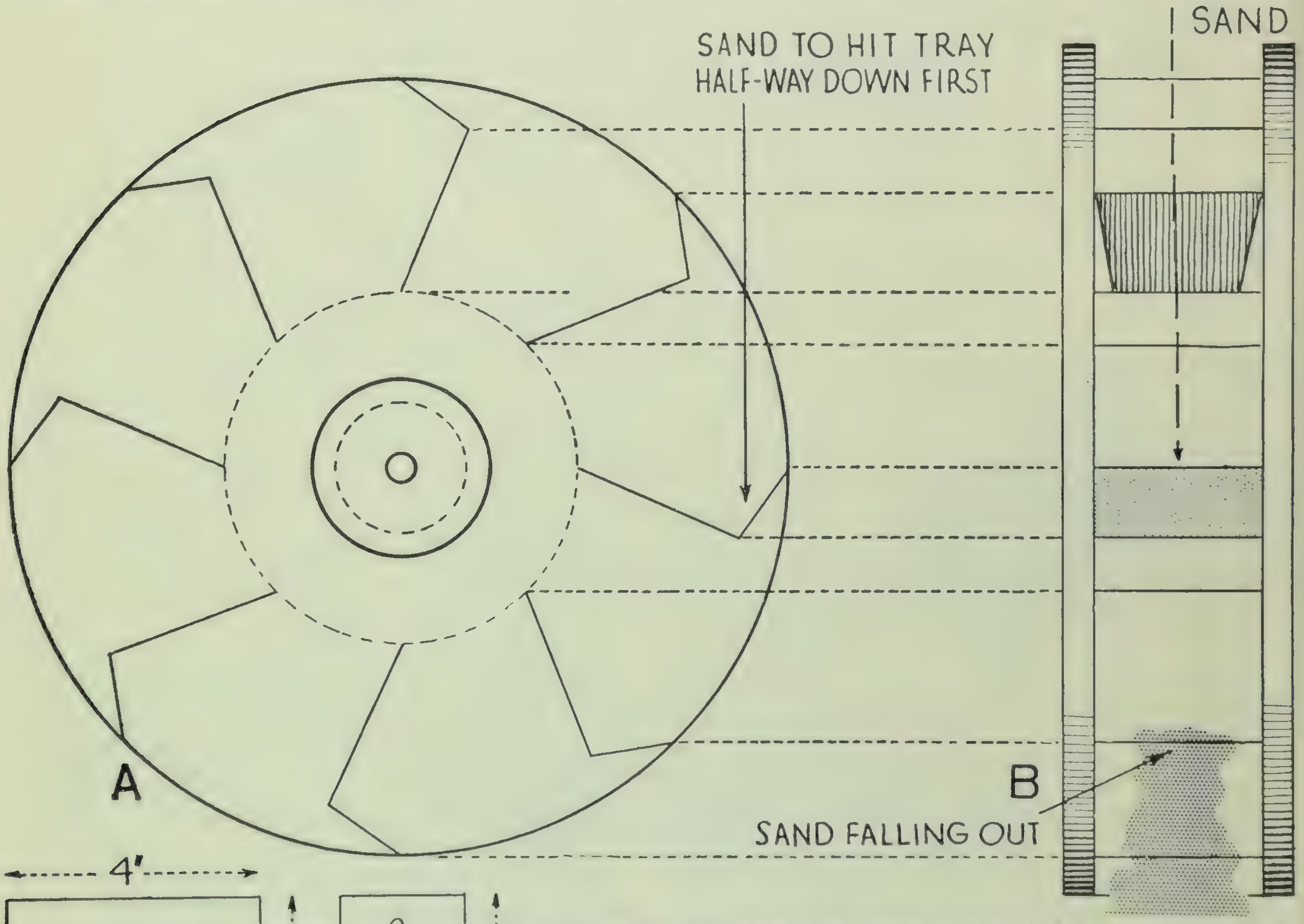


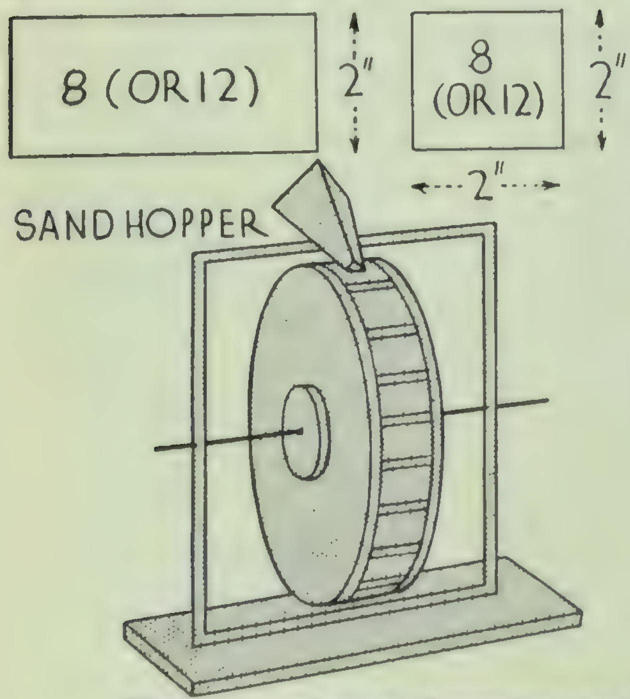
Treadle Fretsaw

[Hobbies, Ltd.

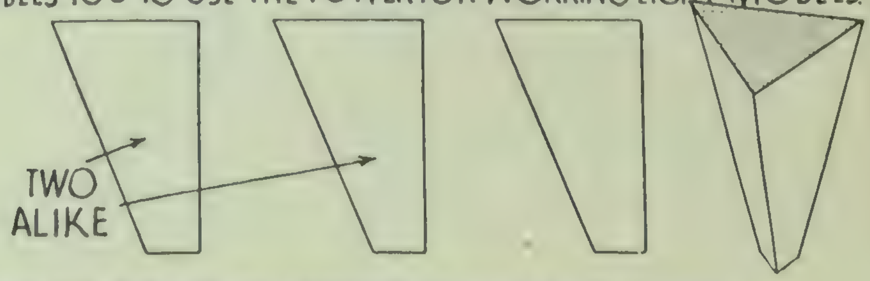
TRY MAKING A FRETWORK SAND-WHEEL


HOW TO MAKE A FRETWORK PULLEY


SAND
SAND TO HIT TRAY HALF-WAY DOWN FIRST
A
B
SAND FALLING OUT


4'
8 (OR 12)
2"
8 (OR 12)
2"
2"
SAND HOPPER

CUT TWO CIRCULAR PIECES OF PLYWOOD 8" IN DIAMETER. NOW CUT 8 (OR 12) OBLONG PIECES 4" LONG BY 2" WIDE AND 8 (OR 12) PIECES 2" LONG BY 2" WIDE. GLUE ALL THE PIECES FIRMLY ON TO ONE OF THE LARGE CIRCLES AS SHOWN IN A ABOVE. NOW GLUE THEIR UPPERMOST EDGES AND PLACE THE OTHER CIRCLE ON TOP. PUT A WEIGHT ON AND LEAVE. WHEN FIRMLY SET GLUE ON A PULLEY IN THE CENTRE... MOUNT ON A STAND WITH A WIRE ROD THROUGH THE CENTRE. MAKE A HOPPER AND FIX ABOVE. PUT DRY SAND IN AND AS IT RUNS INTO THE BUCKETS THE WHEEL WILL TURN. THE PULLEY ENABLES YOU TO USE THE POWER FOR WORKING LIGHT MODELS.



When the sand wheel is complete, be careful to use very fine and perfectly dry sand for the hopper.

sides. All pieces that are to fit together should be glued with hot glue before being nailed. Use the thinnest pin-nails you can get, as thick nails or tacks may split the wood. The fitting of lids of boxes can be performed satisfactorily by first gluing a strip of closely woven calico on the inside where the two pieces of wood meet to form a hinge. When gluing the lid on the Noah's Ark put your calico into position when the lid is wide open and after the fixed half of the roof has been nailed on. Brown paper glued over the calico prevents glue from coming through and makes a very strong hinge. The Noah's Ark may be painted with cellulose paint or oil colours, and the windows painted round the sides. It would be wise to sandpaper all the edges of your animals very well before you attempt to paint them. This makes them seem more real than if their edges were rough and square.

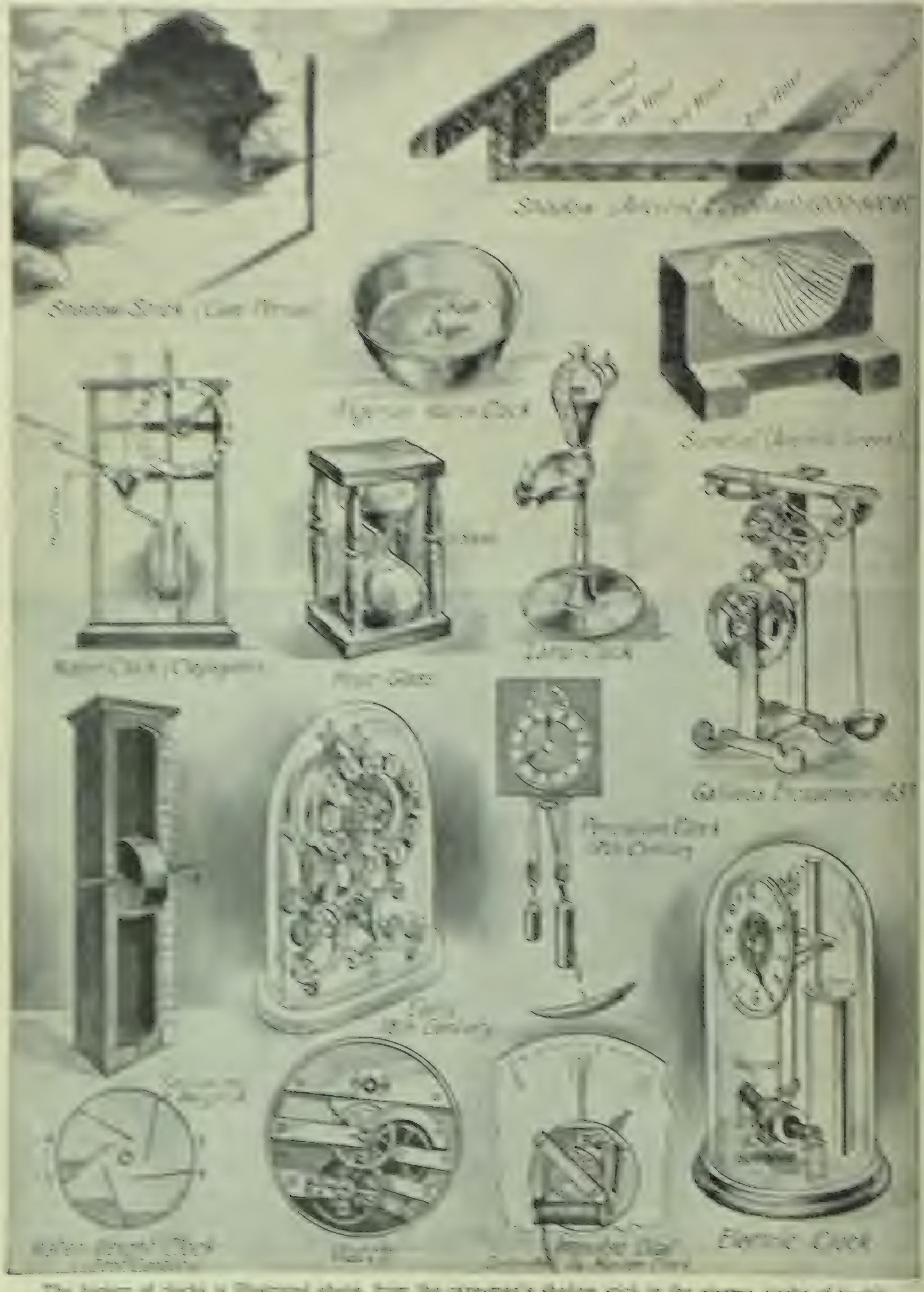
In making a sand-wheel you can set your buckets at angles different from those in the sketch. If you set them as shown in the diagram your hopper should be so fixed on the frame that goes round the wheel that the sand falls into the hopper which is half-way round.

See that the hole through the centre of the wheel and pulley allows the wheel to swing freely. When on the wire shaft the wheel can be made to go with water, though dry, fine sand is better and cleaner as it does not destroy your wood.

Very neat and attractive calendars can be made as Christmas presents when one has a fretsaw and some three-ply wood at hand. First choose a striking coloured illustration of a human figure. For instance, you might have some one skating or playing football, or you may have a picture of Father Xmas. This is glued on to your three-ply wood and cut out, leaving an oblong piece at the bottom and projecting tab to fix into the hole in the base. It is possible, however, to buy moulding which has a groove three-sixteenths of an inch in it. Pieces of this sawn off to the length required can be used as an attractive base for a calendar. It is merely glued into the groove, and no joint is required. Fig. 4 gives examples of this kind of calendar.

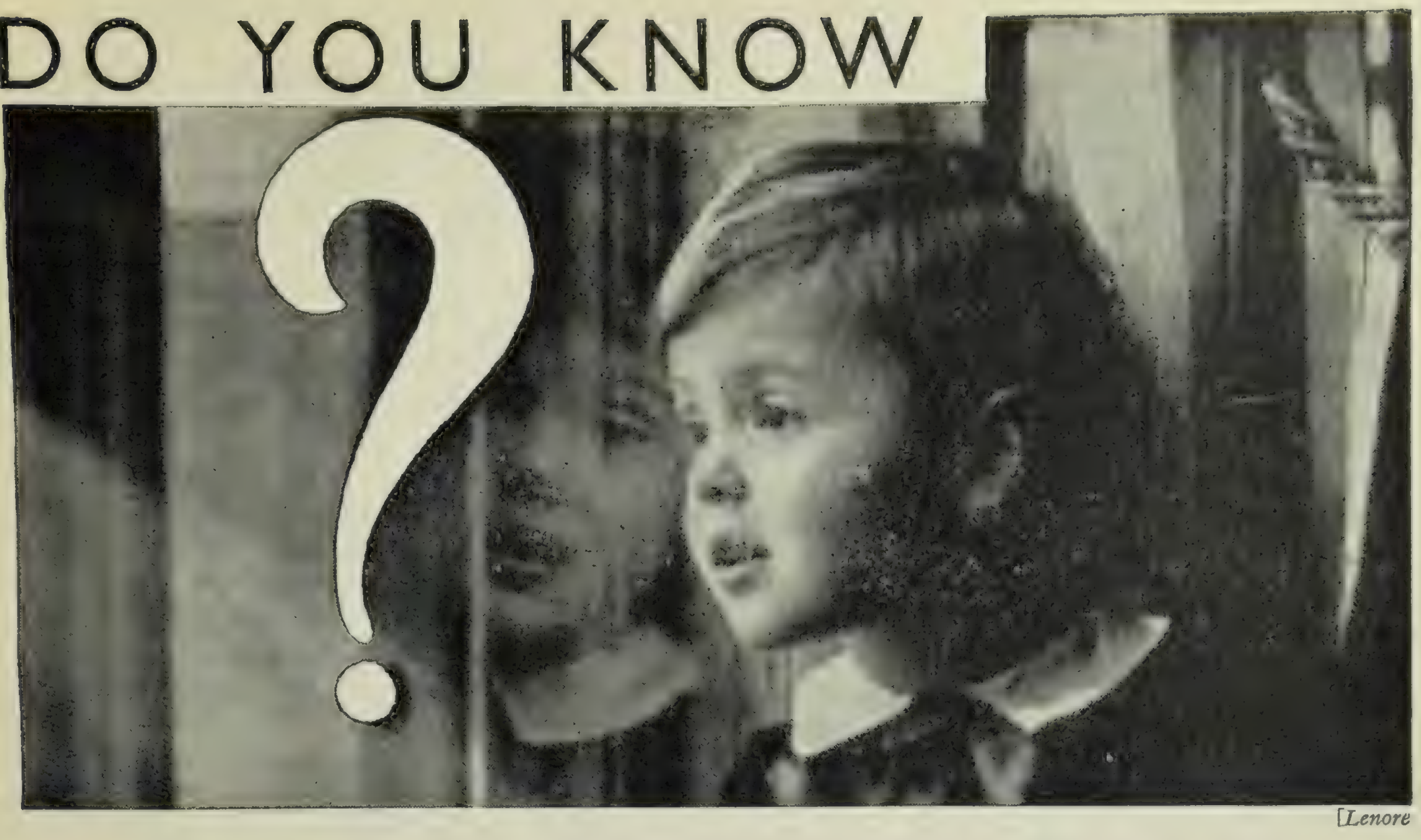
The above photograph shows cut-outs made by boys of ten and eleven years of age. Good pictures from magazines were firmly pasted on three-ply wood and the shapes cut round carefully. The resulting cut-outs are very realistic and at a distance resemble sculptured models. Why not try to make some yourself? [*Photo: John R. Crossland*

MAN MEASURED HIS HOURS IN MANY WAYS


Shadow Stick (Cave Man)
Water Clock (Clepsydra)
Hour Glass
Lamp Clock
17th Century
Watch
Electric Clock

The history of clocks is illustrated above, from the cave-man's shadow stick to the electric clocks of to-day.

DO YOU KNOW



[Lenore

Have you an inquiring mind? If so, it is not always easy to find some one to answer the questions that flash to your brain and puzzle you so much. This section is provided for those to whom "why" and "how" are fascinating words.

DO PARROTS KNOW WHAT THEY ARE TALKING ABOUT?

If you listen to foreign stations on the wireless you will probably become acquainted with some of their call-signs, and eventually find yourself repeating them accurately without having the slightest idea what they mean.

It is the same with the parrot. Though it certainly possesses keen ears and a clever brain, it merely reproduces unintelligently some of the sounds it hears.

WHY DOES A PENCIL, PARTLY SUBMERGED IN WATER, APPEAR TO BE BENT?

When you put a pencil partly into a basin of water you will notice it appears to be bent at the water surface. This puzzling optical illusion is caused by refraction—a physicist's term, which means the bending of rays of light as they pass from one medium to another. This change of direction of the rays makes the pencil look bent.

HOW CAN WE CALCULATE THE GEAR OF OUR BICYCLE?

Divide the number of teeth on the large chain-wheel by the number of teeth on the small chain-wheel and then multiply the result by the diameter of the cycle wheel. Thus if the wheel diameter were 28 inches; the number of teeth on the large cog 35; and the number on the small one 14—the gear would be 35 divided by 14, multiplied by 28 = 70.

Another method is to measure in inches the distance covered by the cycle while the pedals revolve once. Multiply this by 7/22.

WHY DO WE SPRINKLE SALT ON THE FROZEN PATH?

If the temperature fell, ordinary water would almost certainly freeze and make the path dangerous. The addition of salt, however, lowers the temperature at which water turns to ice. It is for this reason, by the way, that fresh water freezes before sea water.

IS THE UNION JACK REALLY MORE THAN ONE FLAG?

Yes. The Union Jack is a combination of the national banners of England, Scotland and Ireland. It consists of a white flag with red cross, the emblem of St. George, England's patron saint; a blue flag with white diagonal cross, the banner of Scotland's patron saint, St. Andrew; and a white flag with red cross, representing the banner of St. Patrick, Ireland's patron saint.

The flag got its name on account of soldiers in Edward III.'s time wearing tunics or "jacks" adorned with St. George's Cross. When James VI. of Scotland became James I. of England, the Scottish banner was added and the combination called Union Jack. The Irish emblem was incorporated in 1801.

COULD A BOY JUMP HIGHER IF HE LIVED ON THE MOON?

He most certainly could. But before we can understand why, we must first know what is meant by gravity. Briefly defined, gravity is the powerful force that the earth exerts over all bodies. If we throw a ball into the air it is the force of gravity which draws it down again; if you fire a bullet from a gun—however powerful—it is the same force of gravity which insists on its eventually returning to earth.

Now the force one body exerts on another is dependent on its size. As you probably know, the moon is not nearly so large a planet as the earth. Thus its force of gravity is not so strong. A boy would, therefore, be able to jump higher on the moon simply because the force pulling him back would not be so powerful.

HOW DOES A FLY WALK UPSIDE DOWN?

The secret is in the structure of the fly's foot. There are two little claws in each foot and under them two tiny pads composed of small bristles. Really these bristles are minute tubes through which the fly can squeeze out quantities of sticky fluid. Hence—by means of these glue-pads and bristles—he is able to walk at any angle on the smoothest surface.

WHY IS BLOTTING-PAPER POROUS?

The substance which gives paper its shine is called size. Quite by accident it was discovered that if size were left out, the paper had peculiar powers of absorption. Thus blotting-paper was discovered, and it only remained for later experimenters to improve upon it and give us the substance we all know.

HOW DID PEOPLE TELL THE TIME BEFORE THERE WERE CLOCKS?

Before the marvellous mechanism of the modern watch or clock was ever dreamed of man relied upon the sun for his check on passing time. The earliest sundial simply consisted of a pole stuck into the ground. As the sun moved from east to west the shadow from the pole also moved along a graduated scale.

The obvious weakness of any sundial is that it is useless on a cloudy day. To overcome this difficulty the Greeks invented an ingenious water-clock in which water was allowed to drip slowly from one vessel to another. The side of one vessel was divided into spaces and the height of the water indicated the hour.

The hour-glass—which is still to be seen in some places—was built on the same principle except that sand was used instead of water. An ordinary kitchen egg-timer is an example of the hour-glass put to a useful purpose.

WHY IS THERE A STRIPED POLE OUTSIDE A BARBER'S SHOP?

The barber's striped pole is just another example of how the relics of long ago live down the ages. It used to be quite common for the local barber to be the local "surgeon" into the bargain! So his pole is a symbol of the splint to which a patient's arm used to be bound and the stripes represent bandages.

WHY DO WE SPEAK OF "BLUE-BLOODED" PEOPLE?

This expression, like so many others, is based on error. Long ago there was a belief that aristocrats possessed superior blue-coloured blood, while commoners had to be satisfied with blood of an undistinguished red colour. Though the inaccuracy of the statement has been proved, it still lingers as a figure of speech.

Actually, we all possess both red and blue blood! That blood which, in its journey round the body, has lost its oxygen and become charged with carbon dioxide, has a purplish hue. But once the heart has pumped it into the lungs the purplish blood loses its carbon dioxide, regains oxygen, becomes red once more and returns to the heart for another trip round the body.

IS THERE AS MUCH OF AN ICEBERG BELOW THE SURFACE OF THE WATER AS ABOVE IT?

There is seven times as much ice below the surface as we see above it. The remarkable thing is that it floats at all. The general rule is that when a thing is cooled it gets denser, or heavier. Consequently, one would imagine that when water was cooled to ice it would sink.

Water, however, behaves very strangely. Though it contracts in the normal way down to a temperature of four degrees centigrade above freezing point, any further cooling results in expansion. In other words, the ice becomes slightly lighter than the water and will just float with seven-eighths of itself submerged.

WHY DO WE SEE THE LIGHTNING BEFORE WE HEAR THE THUNDER?

"Look! Did you see that flash of lightning?" There is a pause. Then comes the dull roll of far-off thunder.

Considering that the thunder and the lightning actually take place at the same time, how is it that the former is always several seconds after the flash?

The answer is simple. Light travels at the amazing speed of 186,000 miles a second. Hence we see the flash the instant it occurs.

Sound, however, is more leisurely, travelling at the much slower speed of 1100 feet a second. Consequently, it takes much longer for the sound waves to reach our ears than the light waves of the flash to reach our eyes.

WHO INTRODUCED DAYLIGHT-SAVING?

William Willett was the subtle man who thought of persuading people to get up earlier without noticing it.

For many years people had been developing habits which prevented them obtaining the full benefits of daylight and sunshine. They had gone to bed at an increasingly late hour and spent more and more sunny hours in bed.

William Willett proposed changing that by the simple method of altering the clocks in summer. His idea met with warm opposition in parliament, and it is possible that even to this day the Daylight-Saving Bill would not have been made law but for the war, which made artificial-light saving very desirable.

In the spring of 1916 Parliament decreed that on a certain day all the clocks should be put forward an hour, thus making us get up earlier though the time appeared to be unchanged. So successful was the scheme that is has remained in force ever since.

WHAT ARE THE LITTLE WHITE MARKS TO BE SEEN ON SOME PEOPLE'S FINGERNAILS?

After an illness you sometimes find there are tiny white marks on your fingernails. These are caused by poorness of the blood, which prevents your nail-cells working properly. People whose blood is normally not of the healthiest are also often susceptible to those marks.

WHY CAN A BEE STING ONCE ONLY, WHEN A WASP CAN STING SEVERAL TIMES?

A bee usually kills itself when inflicting its sting. Stings are very much like two tiny darts, which have saw-like edges and are covered with a sheath containing the poison.

When the bee stings your hand it pushes the sheath into the flesh and then lowers the darts. Here comes the difficulty. The unfortunate insect finds it is unable to withdraw on account of those saw edges. In its fierce struggle to free itself the bee is usually so seriously injured that it dies.

Not so with the wasp. The edges of the wasp's sting are smooth, like the edge of a dagger, and can be quickly and easily withdrawn.

WHAT MAKES A FOG?

Real fogs are not so common on land as most people imagine. What we often mistakenly call fogs are really clouds of smoke and dust-ridden, polluted air which in cold, windless days are prevented from rising and hang like a pall over our buildings and streets. Other kinds of land fog are more accurately termed mists, which are really clouds near the earth.

The fog proper most frequently occurs at sea and consists of perfectly clean and harmless moisture suspended in the air. The real danger of the sea-fog is that it spoils visibility and thus multiplies the difficulties of navigating ships.

Smoke fog, however, is very harmful. It not only affects people's health, but deposits stone-corroding chemicals on buildings, and makes them dirty and ugly.

WHY IS A NEGRO BLACK?

Although the reason for the negro's blackness is not definitely established, it is generally believed his dark colour is the result of long exposure to the sun. Living in the hottest part of the world, where climatic conditions and disease make it nearly impossible for white men to live for any length of time, the negro needs special powers of resistance. In his dark skin lies one of the secrets of the negro's adaptability to a health-destroying environment.

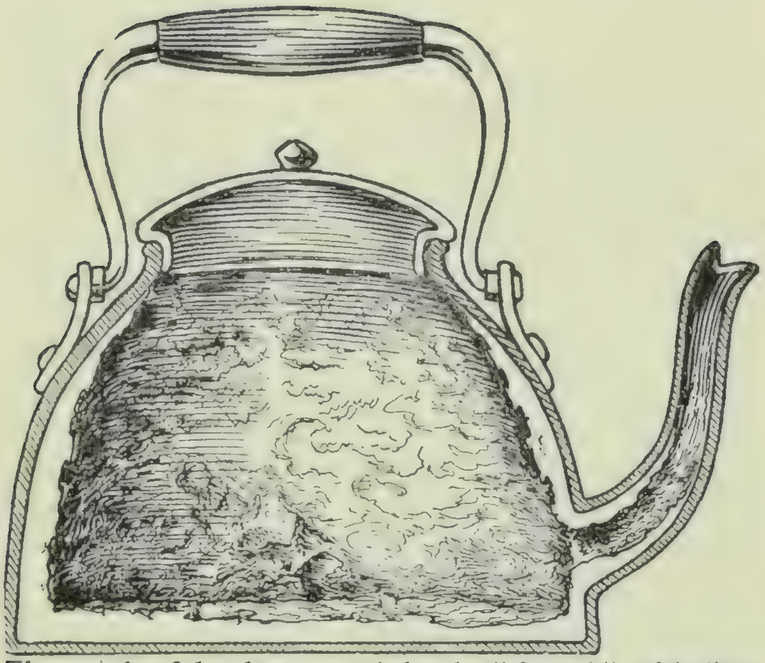
WHY HAVE WE TWO EYES?

When you look at a scene your eyes each see slightly different views which are mysteriously combined by the brain into one picture. This "double vision" enables us to see objects in three dimensions—length, breadth and depth—instead of merely in two dimensions like a common camera. If you look at a bottle with your left eye closed the label will show you that you see more of the right side of the bottle. When the right eye is shut you see more of the left side. By using both eyes at once an impression of solidity is obtained.

A practical illustration of this is to take two photographs of the same scene with a double camera, *i.e.*, one having lenses set apart like our eyes. Place the pictures side by side in apparatus which allows you to look at the left picture with the left eye, and the right picture with the right eye and you will see the objects photographed standing out in relief.

WHO ENABLED THE BLIND TO READ?

How a terrible personal affliction can sometimes prove a blessing to generations of afflicted people is shown by the life-story of Louis Braille. Born in France in 1809, he made it possible for blind people to read books and music.



The result of hard water. A kettle "furred" with lime boiled out of water from chalky soil.

At the age of three Braille became totally blind. Always seeking knowledge, he gradually worked out an ingenious system whereby the blind could read with their fingers.

Letters or figures are represented by combinations of small holes pierced in relief on stout paper. The blind, who usually have an extremely well-developed sense of touch, pass their fingers lightly over the holes and are thus able to read with practice at high speed.

By using this Braille "type" the blind can also read music notation, and in this way people who have never been able to see have become quite accomplished musicians.

WHAT CAUSES THE DEW?

At nightfall, when the sun's rays are withdrawn, the earth begins to absorb heat from the air. As the temperature falls, the water-vapour suspended in the air becomes cooler until a time comes when the air is quite saturated with vapour. Once the temperature drops below this point—known as the dew point—moisture is deposited, in the form of sparkling drops of dew.

In some country districts people construct hollows in which to collect this dew. They are usually lined with clay, which acts as an additional means of cooling the atmosphere.

WHY IS ICE SO EXCELLENT FOR SKATING?

The principal reason why ice is so admirable for skating is that it really melts under pressure, and thus when the blades of our skates cut quickly across the ice they are really moving in a tiny channel of water which offers hardly any resistance to their passage.

Sometimes, when the temperature is extremely low, the ice becomes so solidly frozen that it will not melt under ordinary pressure, and then the surface is a little more slippery than the smooth pavement.

WHY AREN'T OYSTERS ALWAYS IN SEASON?

During the months without an "R"—that is, from May to August—it is the oysters' breeding time, when the young are retained in the gills of the oysters, thus making them unfit to eat.

Oysters breed so rapidly that, but for the fact that their young are eaten by other fish, they would eventually fill up the sea.

Nevertheless, the law has to assist the maintenance of supplies by prohibiting the capture of oysters during the close season.

WHY DO KETTLES "FUR?"

When water is boiled in a kettle carbon dioxide gas is given off, leaving a number of impure deposits inside the vessel. This gradually hardens and the crust thus formed is known as "fur."

These impurities arise where the water runs through limestone and chalky districts before it reaches our taps.

WHY IS THE SKY BLUE?

Strange though it may appear at first, the sky gets its blueness from the sun.

Sunlight is a combination of multi-coloured rays of light which together give a white beam. Flying about in the air are always hundreds of thousands of tiny specks of dust. These specks, struck by the sunlight, absorb all the coloured rays except the blue ones, which are reflected for us to see.

WHAT HAPPENS TO OUR EYES WHEN WE MOVE FROM DARKNESS TO SUNLIGHT?

Close your eyes very tightly and keep them shut for a minute or two. Then, while standing in a bright sun-lit room, open them suddenly and look closely in a mirror. You will notice that the pupils of your eyes rapidly grow smaller as they get accustomed to the bright light in the room. What is the explanation?

The pupils are really little more than protected holes in the mechanism of the eyes through which rays of light pass to form images on the retina at the back of the eye.

The marvellous thing about these holes is that they self-adjust their size according to the needs of the moment. If the surroundings are badly lit the pupils open wide so that they can admit as much light as possible.

WHAT WAS THE DOMESDAY BOOK?

Centuries before the classification work done by civil servants and corporation officials was even dreamed of, there was one giant volume in which the names of kings and great families, of lands and important houses were all written down. Not only was it useful at the time, but has been useful to historians ever since. It was called the Domesday Book, and was compiled by order of William the Conqueror, who wished to know who owned the land in Britain.

WHO INVENTED THE UMBRELLA?

It is impossible to say to whom this distinction belongs, as the Chinese used umbrellas extensively centuries ago. Nevertheless we can acknowledge the courage of Jonas Hanway (who died in 1786), who is regarded as the first user of an umbrella in England.

When Jonas first appeared in the streets of London he was greeted with laughter and ridicule by nearly every one.

WHY DOES A COW CHEW ITS CUD?

The cow has a peculiar and highly efficient way of preparing its food for digestion. After the food has been chewed in the normal way it passes into the first part of the cow's stomach—which has four distinct and separate compartments.

Here the food is softened, before passing on to the second compartment to be made into little cuds. These cuds are then brought back to the mouth where they are chewed for a second time. After being re-swallowed, the food then enters the third stomach division through which it passes to the final compartment for assimilation.

WHY CAN YOU FLOAT ON WATER?

As the human body contains a large percentage of air, it is usually considerably lighter than water and therefore floats on the surface. Possibly you have noticed it is far easier to float in the sea than in the swimming baths. That is because the sea-water contains salt which gives it a greater density and hence increases its resistance to bodies which float on it.

IF YOU CUT A WORM IN TWO WILL IT DIE?

The worm is an amazing creature. You can cut it clean in two with a spade—but you won't have finished with it even then!

As the worm is composed of countless sectors or rings—joined together by hooks—each part can move independently of the rest. Consequently when the worm is cut the head portion containing the mouth can grow a new tail and so continue to live. The other part is not so lucky. Being without mouth, it cannot take food and hence dies within a very short time.

WHY DO AERATED WATERS FIZZ?

The reason is that aerated waters are made by forcing carbonic acid gas into flavoured water. The fizzing is caused by the gas trying to escape. When the cork is released, pressure on the surface of the liquid is decreased and the imprisoned gas immediately rushes out, resulting in the familiar froth.

WHY DOES AN X-RAY OPERATOR WEAR AN APRON OF RUBBER AND LEAD?

It is unfortunate that those wonderful X-rays, which enable us to look through a man and see his delicate machinery at work, are rapidly harmful to the flesh of the operator—more accurately known, by the way, as a radiographer.

A composition of rubber and lead offers the greatest resistance to the penetrating X-rays and consequently protects the radiographer as far as possible.

WHY DO WE SAY: "POUR OIL ON TROUBLED WATERS"?

Oil—being lighter and insoluble—floats on water. It has the property of calming a disturbed surface and smoothing out the waves. In olden times, when boats were far smaller than to-day, it was quite common for sailors to pour barrels of oil over the ship-side to help calm the sea in stormy weather.

WHY DO WE SAY "HEAR, HEAR"?

In olden days when one wished to indicate approval one said "Hear him." Gradually the word "him" was dropped and instead the word "hear" repeated. Hence: "Hear, hear."

WHY IS THIRTEEN CALLED A BAKER'S DOZEN?

This originated in the dim past when the weight of loaves had to be guessed. At that time bakers had no means of gauging the evaporation which took place during the period the bread was in the oven. As they were punished severely for not giving prescribed quantities they added an extra loaf with every twelve in order to be safe.

WHY DO WE GROW TWO SETS OF TEETH?

Animals can grow an unlimited number of teeth but man has become so accustomed to soft foods that Nature has now endowed him with only two sets.

The first, a baby set, contains only twenty teeth, but as we grow up our jaws get bigger and the second set contains thirty-two teeth.

WHAT CAUSES A TOTAL ECLIPSE OF THE SUN?

When the moon passes between the earth and the sun in such a way as completely to block out its rays from us we say there has been a total eclipse of the sun.

Such a phenomenon is exceptionally rare and exceptionally impressive and awe-inspiring. In olden days people were terrified and used to beat drums to scare away the dragon which they believed was devouring the sun. When the moon continued on its path and this eerie "nightfall" passed away, they thought their superstitious efforts had been successful.

A partial eclipse occurs when the moon crosses the direct line between the sun and the earth, but does not completely obscure the sun.

WHY DO WE SHIVER WHEN WE ARE COLD?

Just as man has provided fire-alarms to warn him against outbreaks in mills and houses, so Nature provides the human body with an alarm to tell it when it is getting too cold. If we did not shiver we should possibly not realise the lowness of the temperature of our bodies and take no immediate steps to protect ourselves. Fortunately the cold excites our nervous system and gives us a friendly hint. We shiver!

WHAT DO WE MEAN BY "THE SWORD OF DAMOCLES"?

We say that a sword of Damocles is hanging over a man when we wish to imply that he is in a position exposed to constant danger.

This is how the expression came into being: Long ago there was a cruel monarch named Dionysius. Though no one liked him, he had many flatterers. One of them, Damocles, so often said the King must be the happiest man in the world that in the end Dionysius offered him his position for a short period.

Gladly Damocles seated himself on the flawless throne. All around him were splendrous decorations and unlimited wealth. Then Damocles looked above him. Terror came into his eyes. His fingers tightened in fear round the ornamental arms of his lavish throne. There, dangling above his head, was a sword suspended only by a thin horse hair!

WHY ARE LIGHTNING CONDUCTORS ALWAYS PUT HIGHER THAN OTHER PARTS OF A BUILDING?

Like a good many human beings, lightning can always be relied upon to choose the path of least resistance. Now the purpose of a lightning conductor is to lead the electrical discharge rapidly to earth where it can do no harm. Obviously then its best method of attack is to offer the lightning the path of least resistance. This is done by making the conductor of metal and putting its forked end well above other parts of the building.

WHY ARE THERE THREE BALLS OUTSIDE A PAWNBROKER'S SHOP?

Curiously enough this long-established trade-mark of the pawnbroker had originally nothing to do with his business at all. They were once the arms of a famous Italian family of physicians. When several members set up in business as moneylenders in what is now the famous Lombard Street of London they hung up their family sign outside their premises.

Other moneylenders followed suit, and the three balls came to indicate a place where one can borrow money on pledging goods.

WHAT ARE THOSE LITTLE WHITE POSTS BY THE SIDE OF THE RAILWAY LINE?

They are to help the driver regulate the speed of his train. One of the figures $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$ shows the distance between intermediate mile-posts, while every fourth post shows the distance in miles from that point to the main terminus.

WHAT IS A "BLUE STOCKING"?

It is a term humorously applied to women with literary leanings. The original Blue Stockings were members of a club which met in Paris in the seventeenth century. All the members—both the men and the women—wore blue stockings to indicate their connection with the club.

About 1760 a Mrs. Elizabeth Montagu decided to imitate the Parisian organisation and gathered a circle of women writers at her Mayfair home in London. They, too, wore these distinguishing blue stockings.

WHO INVENTED FIGURES?

The origin of our modern system of figures is lost in the depths of history, but so far as we know it came originally from the Hindus.

Many centuries ago letters of the alphabet were used to indicate numbers. The Romans adopted this system, which they taught to all countries they conquered, including Britain.

Roman numbers were built up by a combination of the seven letters: M, D, C, L, X, V, I. Thus 1933 would be MCMXXXIII.

After the Crusades, however, European countries found a less complicated system—adapted by the Arabs from the Hindus—and since then this Arabic system has gradually come into universal use.

WHO IS THE LADY ON THE BACK OF A PENNY?

It is Britannia holding a trident—a symbol of Britain's greatness. This stamp on our coinage was made in the reign of Charles II. as a gracious tribute to Frances Stuart, Duchess of Richmond, one of the most beautiful society women of her period.

WHY DOES AN OSTRICH BURY ITS HEAD IN THE SAND?

It doesn't. It is a popular but mistaken idea that the ostrich buries its head in the belief that because it cannot see anything itself it therefore cannot be seen by anyone else. What really happens is that at the approach of danger the ostrich sinks into a heap on the ground, where it is exceptionally hard to distinguish from surrounding mounds and ant-hills.

WHAT IS HABEAS CORPUS?

British law forbids any one to be imprisoned unless he is convicted or about to be tried for wrongdoing. If a man is detained awaiting his trial he can make application to the High Court of Justice, which may issue a writ of Habeas Corpus (Latin for "produce the body"), ordering the prisoner to be brought before the Court to decide whether his detention is legal.

This old law was embodied in the Magna Carta, but was later more definitely laid down in several acts of Parliament. In a state of special emergency—such as a time of war—the Habeas Corpus may be suspended. Naturally this action is very unpopular, as the Habeas Corpus is regarded as a principal means of protection from governmental tyranny.

WHAT IS AN ECHO?

Sound can be reflected in a similar way to light. Hence an echo is sound reflected back to its source by some object such as a wall or hillside. Except where sound is able to travel through the air uninterrupted, there are always echoes taking place. Often, however, unless there is stillness around, we cannot hear them.

HOW DO THERMOS FLASKS KEEP HOT THINGS HOT AND COLD THINGS COLD?

The secret of the Thermos flask is explained in its alternative name—the Vacuum Flask.

These useful picnic aids are really vessels with double walls, joined together only at the top of the neck. All the air is pumped out from between the walls, leaving a vacuum through which heat cannot travel as there is no air to carry it.

Consequently cold air cannot reach warm liquids inside it, nor warm air reach cold liquids.

WHY DO WE SPEAK OF SMOKING THE PIPE OF PEACE?

Often when two people patch up a quarrel and agree to be friends we say they are smoking the pipe of peace.

This expression springs from an old Red Indian custom of smoking a pipe—called a calumet—as an indication of friendliness. An Indian chieftain who refused to smoke a proffered pipe was regarded by the others as an enemy.

WHY HAS A SQUIRREL A BUSHY TAIL?

A squirrel is provided with a bushy tail for two reasons. Firstly, it provides him with an excellent blanket with which to cover his back and face during his long winter sleep. Secondly, in summer time he finds it useful as a rudder. As he leaps from one bough to another, it guides him safely to his landing-place.

WHY DOES A CAT ALWAYS FALL ON ITS FEET?

The cat is able to accomplish this clever feat of always landing on its feet when it jumps to the ground through generations of practice, which has sharpened its instinct for bringing certain muscles into instant play. According to scientists, men would be able to alight with a cat's agility if they could make decisions as quickly, and train their muscles to respond with sufficient speed.

WHY DO CIGARS HAVE BANDS?

In Cuba cigars are smoked when they are moist. To prevent the green moisture or nicotine staining the smart gloves of the fashionable young Spaniards who smoked them, a narrow strip of paper used to be placed round them. Gradually the manufacturers started to adopt this idea, the more enterprising of them seeing that there were advertising possibilities in it.

Samuel Plimsoll, pioneer of better treatment of merchant seamen. He is commemorated by the Plimsoll mark shown in the diagram below.

DO WE HEAR THE SOUND OF THE WAVES WHEN WE PUT A SHELL TO OUR EARS?

No. It is little more than our imagination which likens the noise we hear to the sound of waves beating on the shore.

Actually the shell acts as a reflector or resonator of small sound waves, collecting them and giving them added strength, in the same way as a sounding board over a pulpit makes the preacher's lowest whisper audible in distant corners of the church.

Around us there are always very slight sounds which the human ear is not sensitive enough to detect. What the sea shell does is to magnify these noises so that we can hear them. If you took the shell into an absolutely sound-proof room, completely cut off from all noises, you would hear nothing.

WHY DOES YOUR MOTHER WEAR A WEDDING RING?

Mother's wedding ring is really a relic of ancient times, when men used to own their wives in the same way as cattle and sheep. Authorities on early customs tell us that men in those far-off days bullied their wives into slavery, compelling them to wear heavy chains or rings round their bodies to show to whom they belonged.

In this more enlightened age chains and body rings have been discarded. Instead another—not so oppressive—token of ownership has been invented. Thus we have the wedding ring.

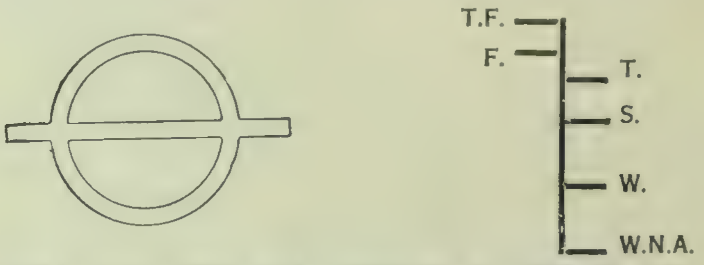
CAN FISHES CLOSE THEIR EYES?

It is quite impossible for fishes to close their eyes—even when asleep—because they have no eyelids. They are not alone in this respect. On your next visit to the Zoo watch the snakes carefully. You will notice that though a snake is stretched inert on the ground—obviously " sleeping "—its eyes are still wide open.

Human beings could, in theory, sleep without closing their eyes. But the effort of keeping the lids open is too great. So we adopt the easier course—and shut them!

WHAT IS THE PLIMSOLL LINE?

Until about 60 years ago there was no limit to the extent a shipowner could load his vessel. Often boats were so scandalously overloaded that they sank and the lives of the crew were lost. But as the crafty owner had insured the cargo beforehand he lost nothing.



Load Line (left) and markings of Plimsoll line. T.F.=Tropical Fresh Water. F.=Fresh Water. T.=Tropical Sea Water. S=Summer. W.=Winter. W.N.A.=Winter, North Atlantic.

A Member of Parliament, named Samuel Plimsoll, strongly opposed the practices of these " coffin ships "—as they were called—and suggested a plan for removing the menace. As the depth a vessel sinks below the surface of the water is in proportion to the weight of the cargo, he recommended a line should be painted round the side of the ship. If that line disappeared below the surface it showed that the cargo was dangerously heavy.

WHY DOES OUR HAIR GO GREY?

Suppose you are a handsome youth with a fine head of dark hair! The production of the pigment, that is, colouring matter, which has given your hair its dark colour depends on the health of the whole body and largely on the nervous system. As your " machinery " ages it gradually begins to function less efficiently and the production of pigment slowly ceases, causing our hair first to become grayish and eventually quite white.

WHY OUR HANDS BECOME WARM AFTER SNOWBALLING?

When our hands are not being normally heated—by the fire, for example, or the sun's warmth on a hot day—they are kept warm by an increased blood supply.

Actually the snow makes the exterior of our hands cold. But the brain—which is really responsible for controlling the heat of our bodies—strengthens the blood supply by opening little cells in the skin, thus admitting warm blood to the chilled hands.

So it is not the blood itself that is warmer—otherwise we should notice it all over our bodies—but simply an extra heat that comes from the quicker and richer supply.

WHY DOES AN ONION MAKE US CRY?

All the time we are awake tiny glands near the eyes are producing a normal supply of tears with which the eyelid cleans our eyeball of specks and dust. When the glands form tears so quickly that they cannot all escape together our eyes water.

Now onions give off a gas which has this very effect of exciting nerves at the tip of the nose, which in turn cause the tear glands to "work overtime."

Fortunately these tears prevent the gas given off by the onion from damaging our eyes. People who complain of smarting eyes when they are peeling onions are really to be sympathised with. Their tear glands are not working properly.

WHY DOES MUSTARD BURN OUR TONGUE?

Many young people avoid mustard because it burns their tongue. Here is why:

Mustard, like several other substances, has the power of causing the tiny blood-vessels in tender parts of the body, such as the tongue, to swell and even discharge some of their contents. Pressure is exerted on the nerves, the ends of which are irritated, giving rise to a burning sensation.

IS A SHOOTING STAR REALLY A STAR AT ALL?

No: it is neither a star, nor does it "shoot." Though their exact nature is not known, astronomers have given these bodies which pass through space the name of meteors.

Now, how is it we can see them as bright objects? Well, all young people know that friction—i.e., the rubbing of one particle against another—can cause intense heat. It is the same with meteors. Their headlong passage through the atmosphere actually causes sufficient heat to make them white hot, and in some cases to melt them away to nothingness.

Occasionally, however, these meteors strike the earth. They are then known as meteorites. They look like large and irregular-shaped stones. In another part of this book you may read of a huge hole in the earth made by a gigantic meteorite that once fell in America.

WHAT MAKES OUR FEET GO TO SLEEP?

What has really happened when this unpleasant sensation of numbness comes to our foot is that undue pressure—often caused by sitting in an awkward position—has been brought to bear on the limb in question.

Through compression of their fibres, the nerves have become incapable of transmitting impulses or commands from the brain. For the same reason we cannot make our foot do exactly what we want, because the motor nerves have also been put out of action.

Fortunately the damage does not last for long. As the pressure is removed, the nerves gradually regain their power—meanwhile reminding us of their harsh treatment by giving us a dose of "pins and needles."

WHY DOES YOUR FACE WHITEN WHEN YOU ARE AFRAID?

What puts the "roses in your cheeks" is largely the colour of your blood shining through the skin. This blood, as you probably know, is pumped to all parts of the body by the heart.

Now instantly you are frightened the nerves running from the brain to the heart almost put a stop to the heart's beating. Consequently the blood supply that should go to your face is cut off and the skin becomes pale.

WHY DO WE BLINK OUR EYELIDS?

The real object of blinking is to give the eyeball a wash and rid it of any dust or other irritating particles. Every time we blink the fluid that we call tears is set free from its little home in a gland and so allowed to pour over the front of the eye.

DOES A RED RAG REALLY IRRITATE A BULL?

If we wish to speak of something which immediately angers a person we often say: "It is like a red rag to a bull."

Actually there is really no definite proof that all bulls have an instinctive dislike for anything red. Experiments with human beings, however, show that certain colours have certain effects upon the nervous system. We may believe, then, that the brightness of a red cloth—especially if it is moving backwards and forwards across its eyes—has the opposite of a soothing effect upon the beast.

WHY IS THERE A GAP BETWEEN PORTIONS OF A RAILWAY LINE?

All metals grow bigger (or expand) when the temperature increases, and decreases in space again (or contract) when the temperature falls. Even the comparatively small differences of temperature between night and day are sufficient to bring about a surprising change in volume.

This question of expansion is a factor of immense practical importance to engineers and builders. If railway lines were laid without these compensating gaps, the relentless force of expansion would buckle them completely out of truth, and there would be terrible train disasters.

DO YOU EVER WASH YOURSELF WITH AN ANIMAL?

Strange — but perfectly true! After believing for many years that they belonged to the vegetable kingdom, it was discovered that the ordinary bathroom sponge is really an animal, though admittedly very low down in the scale of life. Chiefly found fixed to rocks on the sea-bed, these live sponges look very different to the ones we know. In their natural state the framework of cells is covered with a jelly-like substance. They are, so to speak, all mouth, living on the water which passes into their body through the small holes of their surface and out again through the larger holes.

DO YOU WASH WITH FRUIT?

If you use a loofah to scrub your skin you are really using the skeleton of a fruit from a tree of the gourd family. This fruit grows on a climbing plant found in Egypt and Japan. Inside there is a network of fibres to protect the seed. When the fruit is dried and the flesh, rind and seeds pounded and washed away, the skeleton remains, and forms a fine flesh-brush for the bathroom.

WHAT IS PUMICE STONE?

You have just read of an animal and a fruit used in the bathroom for cleansing purposes. Now comes a member of the mineral kingdom to clean the grime from your fingers when soap, water, sponge and loofah together give up the task as hopeless.

This is the gray stone we know as pumice. A dead piece of stone it seems, but in its early days on earth it was far from dead. It came from the bowels of the earth in a volcanic eruption, for pumice is the cooled and solidified froth that forms on molten lava as it pours down the sides of a volcano in eruption. It is spongy in texture and cleans the skin of the hands by taking off a tiny portion of the skin's surface. So do not rub too vigorously in one place with pumice.

WHAT IS THE DIFFERENCE BETWEEN FLOTSAM AND JETSAM?

When a ship is wrecked and its goods are found floating in the sea, they are known as flotsam. Sometimes, however, when a ship is caught in a terrible storm, it is necessary to lighten the vessel, so that it will survive the tempest. The goods so thrown overboard are known as jetsam. The act of casting overboard such goods is known as *jettisoning* of cargo.

WHAT ARE THE TRADE WINDS?

They are certain winds that blow across the ocean with perfect regularity. They blow from the north-east in the northern hemisphere and from the south-east in the southern hemisphere. They change their direction once every six months, in certain areas, blowing in the opposite direction half the year. In the old days of sailing ships these winds were relied upon for taking trading vessels over the ocean, and thus became known as trade winds.

WHAT IS A SCAPEGOAT?

A person who takes or is made to bear the blame for the faults of others. It originated in the olden days of the Jews. On the Day of Atonement two goats were brought into the tabernacle and taken to the high altar. Here lots were cast and the goat on which the lot fell was offered up as a sacrifice. The other had all the sins of the people transferred to it by the high priest and it was then set free in the wilderness.

HOW DID TRAMS GET THEIR NAME?

A man named Outram was the first to suggest that wheeled vehicles might be made to move along more easily if smooth tracks were laid down for them. The lines or tracks so laid were known as the Outram Way, later shortened to tram-way.

WHY HAVE MANY CHURCHES A WEATHER COCK ON THEIR SPIRES?

About a thousand years ago the Pope of the time made a law for the church, in which he ordered the figure of a cock to be placed on every church steeple, to remind worshippers that once St. Peter denied knowledge of Christ three times before the cock crowed twice. The ancient custom of placing a cock, with cross-arms bearing N., S., E. and W. on them, has survived from the ninth century.

Buckingham Palace—the dignified abode of kings. In front you can see the beautiful marble memorial to Queen Victoria, grandmother of King George V., who was the first Queen to live regularly at the Palace.

DEAR OLD LONDON TOWN

" All roads lead to Rome " was a saying of olden days. In our own time we might well say " All roads lead to London." For the dear old city is the heart of our Empire as well as the largest city in the world. Father Thames is the home of the world's greatest port, where ships of all nations bring in weird and wonderful cargoes and steam away again laden with our own merchandise destined for other lands. In London are our King and Queen, our Government, our principal bank, our records of a mighty past. London fascinates every one who visits it, and it has a charm that cannot well be expressed in words. It is fitting that, after our journey through the ages and in all lands, we come back, as we near the end of this book, to our homeland, and visit its very heart—dear old London.

" HOW many miles to London Town ? " Possibly this was what Dick Whittington said to his cat more than once as they made their way to the big city where Dick hoped to make his fortune. And he did, you remember, for he married his master's daughter and became Lord Mayor of London. Like Dick, most of us ask this question some time or other in our lives, for dear old London calls us all.

One of the things that astonishes us about London is its size. There are miles and miles of streets full of buses and motor cars and hurrying people, with shops and houses, cinemas and banks, blocks of flats and offices on either side. This great London has grown from quite a little town, begun over two thousand years ago on a low hill among the marshes of the Thames. The Romans beautified the city and built a stout stone wall around it. A piece of this wall can still be seen in the street called London Wall. The gateways in the wall have all disappeared now, but their names remain, Aldgate, Aldersgate, Bishopsgate and Moorgate, Cripplegate, Newgate and Ludgate. In the wall of the Old Bailey, the big police court where Londoners who break the law are tried, there is a blue tablet which says, " Site of Newgate, demolished 1777." Similar tablets are to be seen where other gates once stood.

LONDON'S CATHEDRAL, THE STATELIEST PARISH CHURCH IN ENGLAND.

Let us go into the city, as the area occupied by the old town is still called. Walking up the narrow street called Ludgate Hill we shall come at once to St. Paul's Cathedral, a building known to people all over the world. St. Paul's is the mother church of the many churches that abound in the city, tucked away in quiet courtyards, or standing full on the street in the midst of the city's bustle and din. You will hardly notice

The Mansion House and the Bank, viewed from the roof of the Royal Exchange. The Mansion House, where the Lord Mayor stays, is in one of the busiest parts of the city. [*E.N.A.*

many of them as you walk along the street, for they are almost hidden by the tall buildings that surround them. But if you go into St. Paul's and climb the twisting staircase that leads out on to the great dome, you can see their stately towers and graceful spires rising among the roofs of the city's offices and warehouses, where business goes on all day and often far into the night.

THE CHURCH THAT WAS BURNED IN THE GREAT FIRE, AND REBUILT BY A FAMOUS ARCHITECT.

St. Paul's is not the oldest of the city's churches. Old St. Paul's was burned down in the Great Fire of 1666 that you read about in history books, and a new church was built by Sir Christopher Wren, one of the greatest of English architects. On the broad flight of steps that leads up to the west doors, London's pigeons strut and preen themselves, and above the pillared front rises the beautiful dome with its golden cross, which looks almost as if it were on fire when the sun shines down upon it. Within are wide aisles and stately pillars and monuments to England's famous men. Those of Wellington and Nelson are the finest, but there are many others to men whom we remember for the service they gave their country in peace as well as in war. Wren himself is buried in the crypt below the church, and above his grave are these words in Latin, "If you seek his monument, look around you."

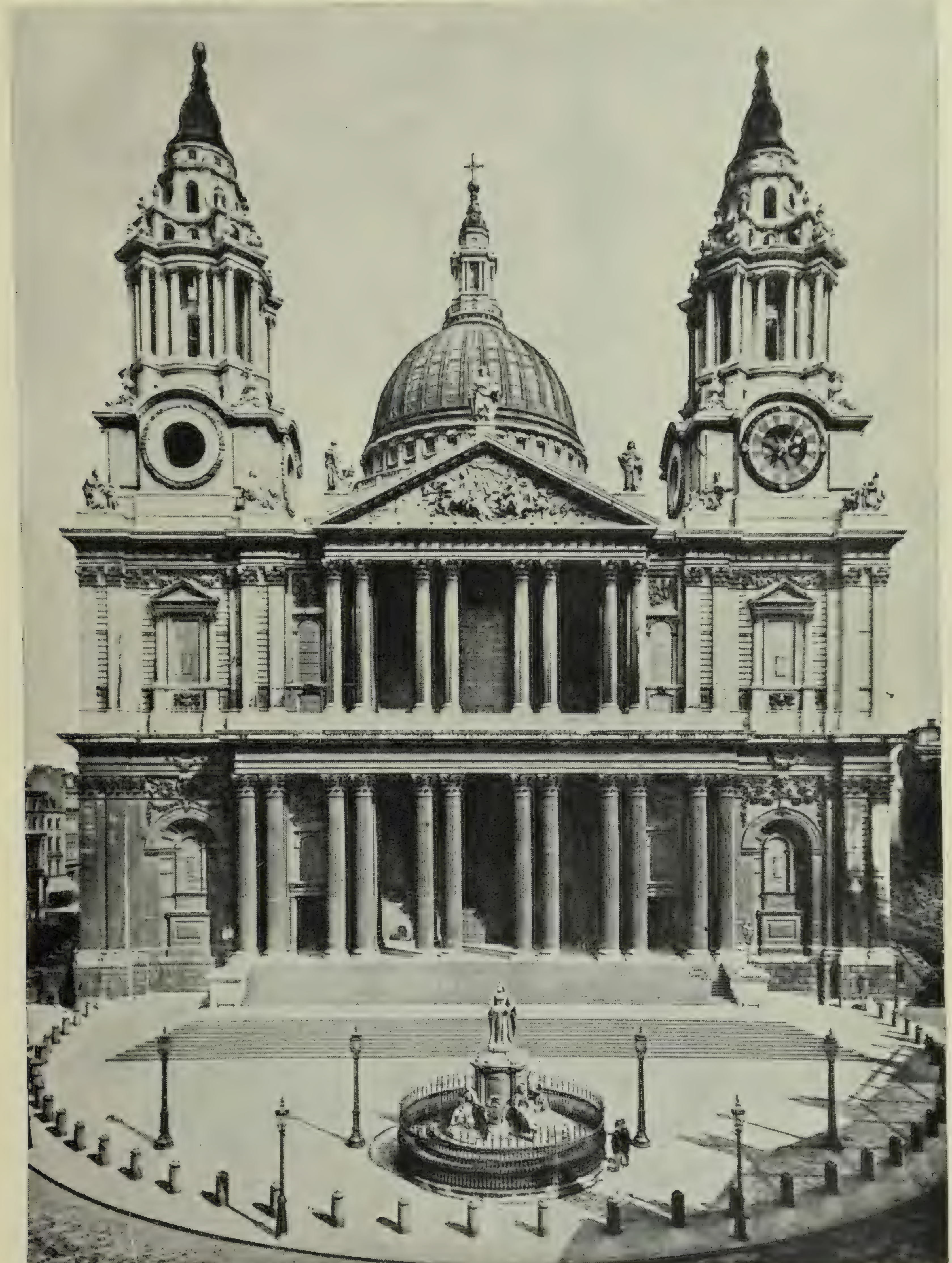
THE GREAT BUILDING WHERE OUR LETTERS ARE DISTRIBUTED TO ALL PARTS OF THE WORLD.

Only a stone's throw from St. Paul's is a big block of gray stone buildings. This is the General Post Office, from which news is sent out by letter and telegram, wireless and cablegram to all parts of the world. Here, if you write to a cousin in Australia or Canada or South Africa, your letter will come from your own post office. All night men are busy sorting and stamping, and then the bulky mail bags are sent down to the post office underground railway which carries them on the next stage of their journey to ships or trains or aeroplanes.

Past Bow Church, with its famous "Bow Bells," and the Guildhall, where more pigeons circle and flutter, we go to an open space into which seven streets lead. Each of them pours its stream of traffic into it, long strings of red omnibuses, taxi-cabs and motor vans, horse-drawn lorries, and even people on bicycles. It is wonderful to see how a few policemen manage all this traffic and look after the people who are constantly wanting to cross the road. If you look closely you will see that the helmets worn by these policemen are slightly different in shape from those worn by the police in other parts of London. This is because the city police are controlled by the Corporation of the City of London, which still manages all the affairs

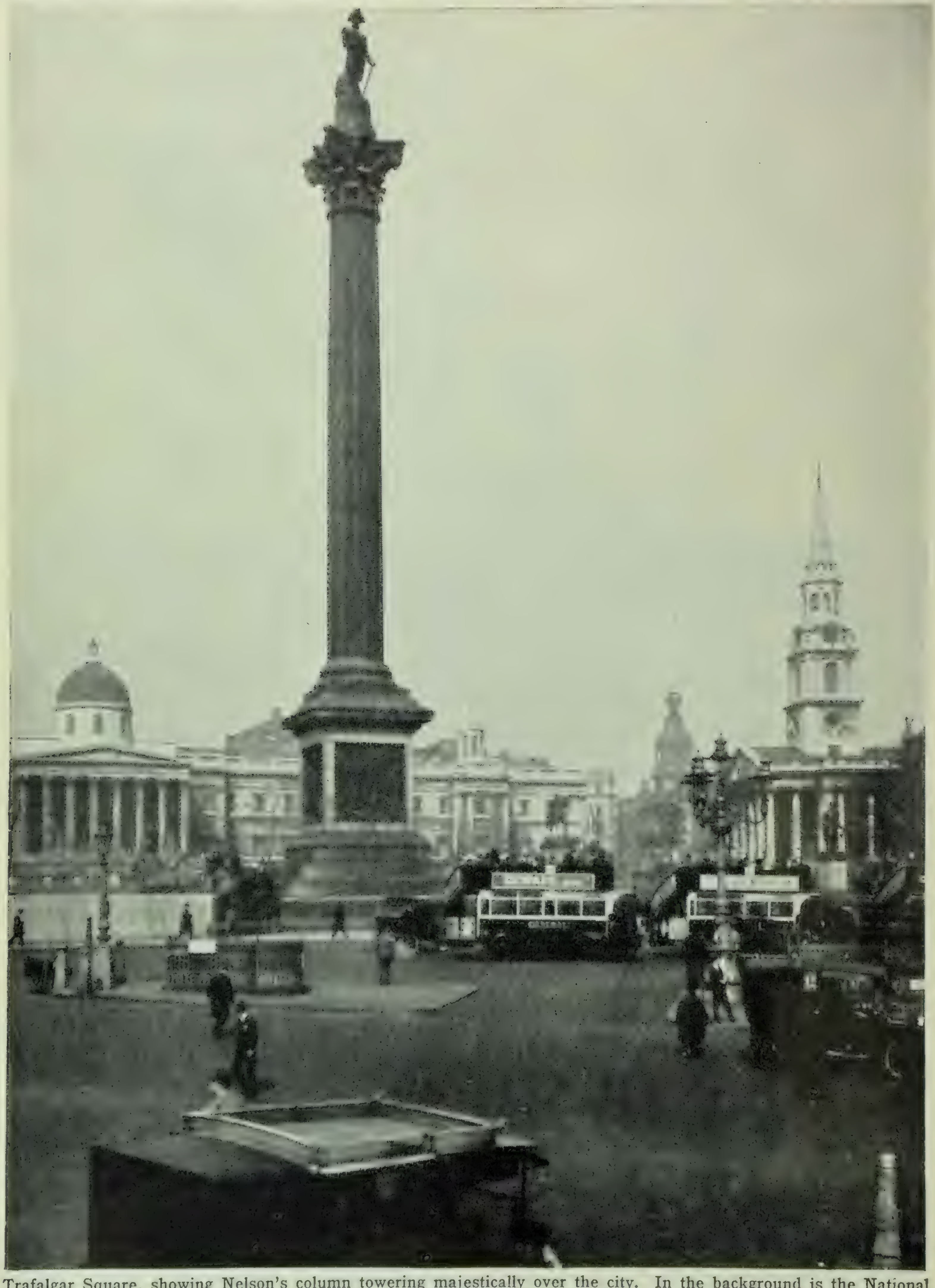
A stately procession through the streets of London takes place at the State opening of Parliament. Note the beautifully-decorated coach in which the King rides on his journey past crowds of enthusiastic onlookers. [*Topical*

A FAMOUS CHURCH WHERE MANY HEROES REST

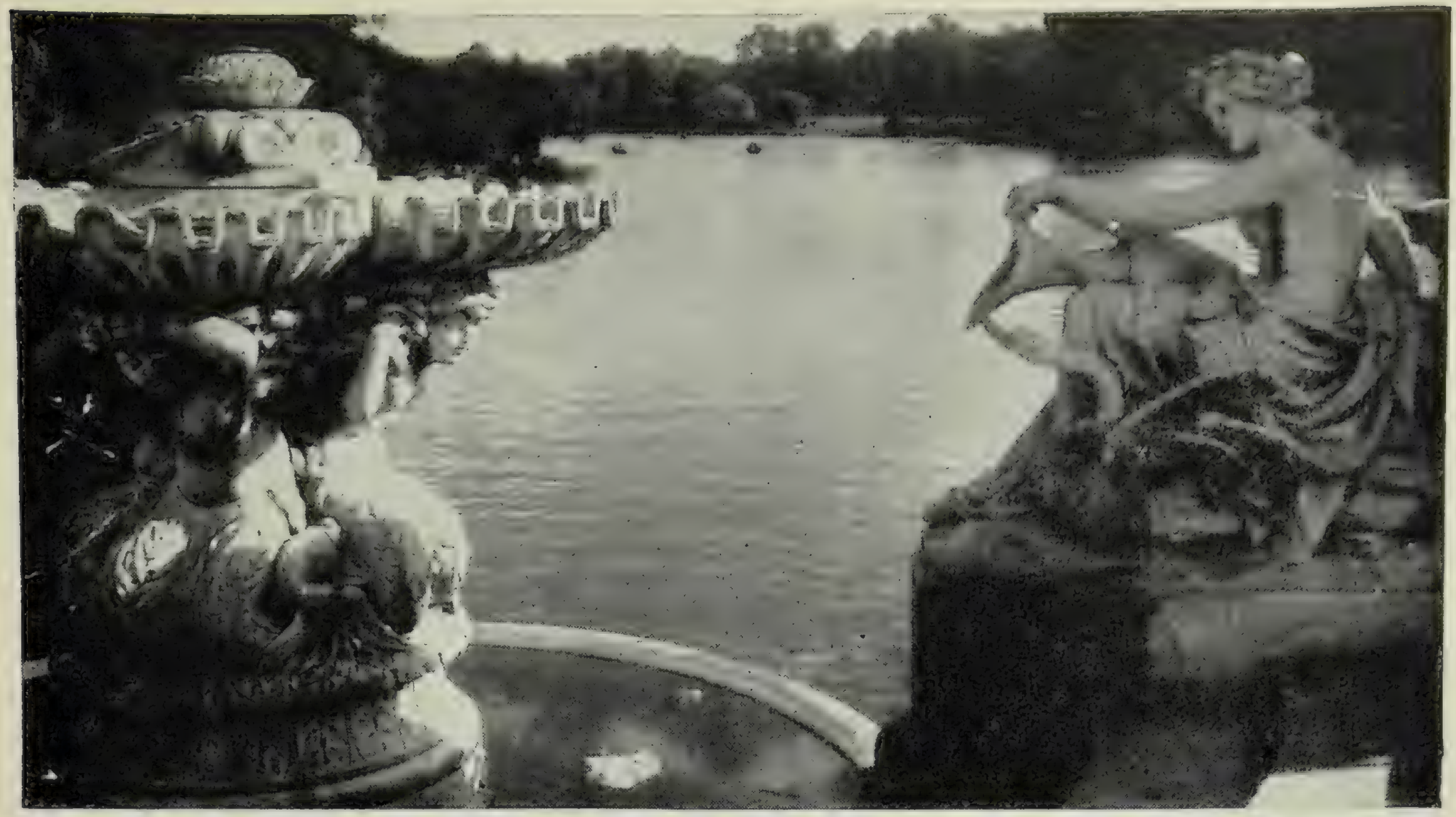


St. Paul's Cathedral, with its beautiful dome and golden cross, is one of London's most stately buildings. It was built by Sir Christopher Wren, a famous English architect, after the old church had been burned in the Great Fire of 1666. Inside there are many monuments to England's famous men. Those of Wellington and Nelson are perhaps the most notable. Wren himself is buried in the crypt below the building that was the work of his brain.

A STATELY COLUMN IN THE HEART OF LONDON



Trafalgar Square, showing Nelson's column towering majestically over the city. In the background is the National Gallery, and, on the right, the tower of the Church of St. Martin's-in-the-Fields. This part of the city is a hunting ground for tourists, who find many places of interest to visit. [E.N.A.



A lovely scene on the Serpentine in Kensington Gardens, where Londoners resort when in holiday mood and when they want to forsake the noisy streets and find peaceful surroundings. Boating and bathing are popular pastimes on the cool waters that look so inviting in the picture. Note the beautiful figures on the fountain. [E.N.A.

of the city, just as it did in old times before Greater London came into existence.

On the right you can see the Mansion House, the home of London's Lord Mayor, and in front is the Royal Exchange, where a great deal of London's business is done. Men in top hats, clerks with bundles of papers under their arms, and messenger-boys with their pill-box caps set slantwise on their heads, dash in and out. Facing the Royal Exchange is another great building, white and clean in contrast with the smoke-stained stonework of the Exchange and the Mansion House. This is the new home of the Bank of England. If we could peep into the vaults below ground we should see bars of gold, safes containing bundles of paper money and securities, piles of silver and copper and even golden sovereigns, which we rarely see in our purses nowadays. For here most of England's money is kept. Perhaps you have all heard the words " as safe as the Bank of England."

"LONDON BRIDGE IS FALLING DOWN, FALLING DOWN, FALLING DOWN."

This is a line of an old song, which reminds us of the days when London Bridge was built of wood. Then there came a time when there was a stone bridge with a narrow cobbled street with houses on either side. It must have been pleasing to have looked out of your back window straight down into the river. To-day there is a broad bridge with low parapets, and looking down the river from it you can see one of the most fascinating sights in London, the Port of London. It is full of shipping—cargo steamers, barges, fussy little tugs and motor boats—all concerned in the great business of trade that makes London one of the busiest ports in the world. Spanning the Port we can see the Tower Bridge, the last bridge over the river before it widens out into the estuary, where great steamships anchor in the fairway, or come up on the tide to berth in the big docks which have been constructed by England's skilled engineers on the north side of the river. Dockland is another interesting part of London where one can wander for hours watching the great vessels being laden and unladen at the quays or starting out on their voyages to every part of the world.

THE STRONG TOWER WHERE PRISONERS WERE GUARDED IN OLDEN DAYS.

Close to the Tower Bridge is the Tower of London, the strong fortress built by William the Conqueror to guard the river entrance to the city. In its stout keep are little rooms where prisoners languished for years and, like Walter Raleigh, wrote their names on the walls. There is a gate leading into its courtyard from the river, which is called the Traitors' Gate. Through it many princes and nobles have entered never to come forth again. To-day the Tower is the stronghold where the crown jewels are kept, sceptre and orb and the crown itself, in

The Mappin Terraces, where the bears of the London Zoo make their homes, and perform their amusing tricks for the benefit of their visitors. What do you think of their little colony ? It is one of the most popular parts of the Zoo. [*E.N.A.*

which flashes one of the most precious jewels in the world, the Koh-i-noor diamond.

We have done enough sight-seeing in the city—dear old London has other attractions for us. Let us get on a bus and go to Regent's Park, in which are the Zoological Gardens. The Zoo is one of the most popular of London's playgrounds, both for grown-ups and children.

Which of the animals shall we see first ? It is difficult to choose, there are so many. We can go to see the seals, with coats like velvet as they bask in the sun or glide swiftly through the water, or watch the lioness playing with her cubs, while her mate pads backwards and forwards in his cage. Or we can throw buns to the bears on the terraces, and nuts to the monkeys, and we must go for a ride on the elephant, who can take six or seven children all at once on her broad back.

KENSINGTON GARDENS IS LONDON'S MOST POPULAR PLAYGROUND.

We could easily spend a whole day at the Zoo, but there are so many places to see. So let us go westwards to another of London's playgrounds, Kensington Gardens. This is the dogs' as well as the children's paradise. Here on fine days Londoners bring their dogs to romp and play on the wide stretches of grass, and here are sand-pits, swings and see-saws for children who live in crowded streets and have no gardens of their own to play in. And beside these there is the Round Pond where grown-ups as well as children can be seen every day launching white-sailed yachts and miniature motor boats. Most of them come safely to shore on the other side, but some stop short in the middle of the pond, and have to be rescued by the friendly park-keeper with a long pole.

From Kensington Gardens we can go to Hyde Park, where in the early morning people ride in the Row, and all day long the Serpentine is dotted with little boats. On one side of this long stretch of water is a splendid swimming enclosure, to which Londoners have given the nickname of Lansbury's Lido. On a hot summer's evening this swimming pool is full of people, and there is often a long queue waiting their turn.

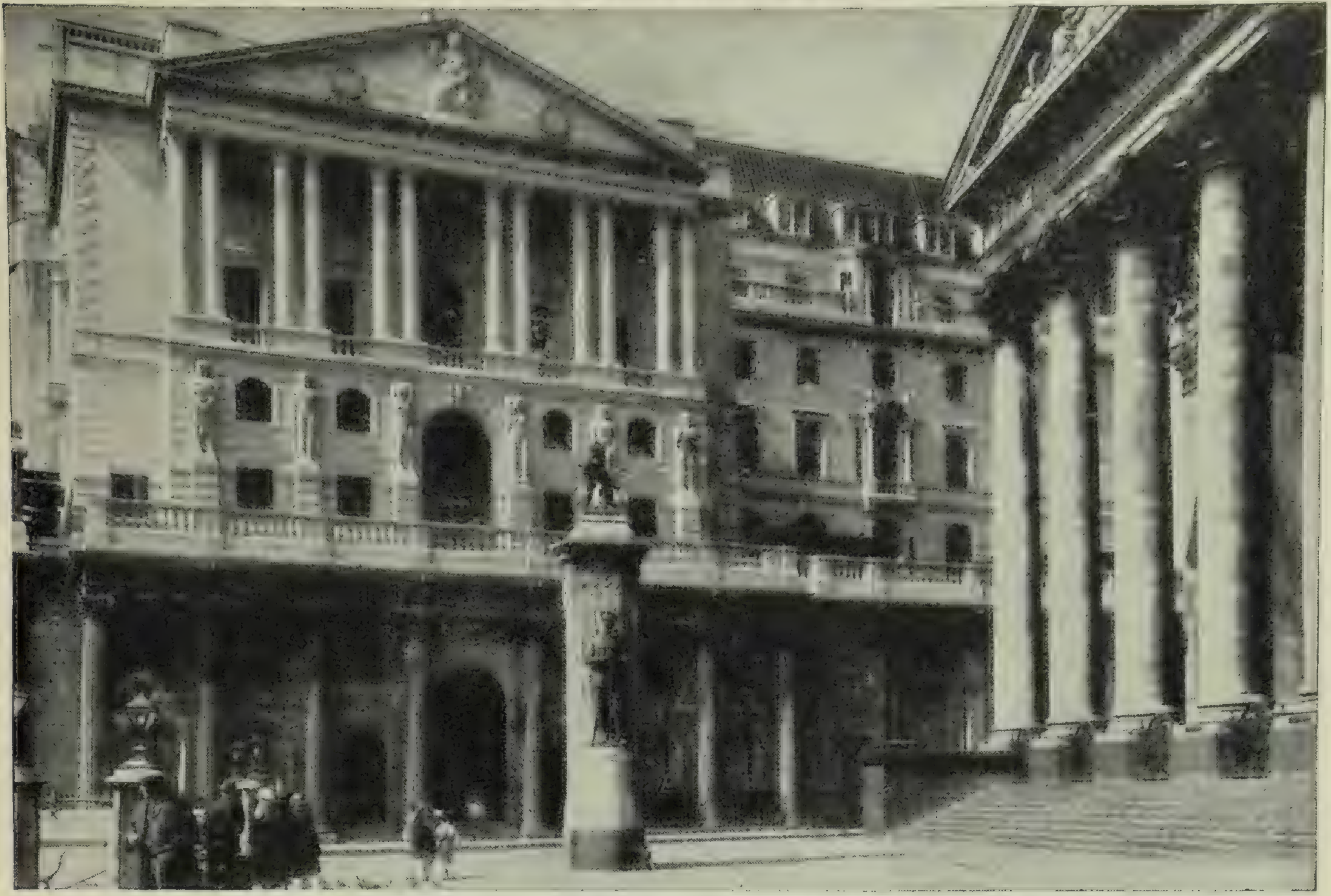
THE STATELY PALACE WHERE KINGS AND QUEENS MAKE THEIR HOME.

Let us go now to Buckingham Palace, where perhaps we may be able to see the King. It is a long stone building, with a big courtyard in front and a lovely garden behind. In front of it is the beautiful marble memorial to Queen Victoria, King George's grandmother, and around it stretch the green lawns of St. James's Park, gay in spring with clumps of crocuses and daffodils. From the gates of Buckingham Palace a broad, tree-lined avenue, called the Mall, leads up to the Admiralty Arch. This is the road which the King and Queen take when they drive in procession on State occasions, such as the opening of Parliament. Through the Admiralty Arch we come to Trafalgar Square, with the National Gallery and the beautiful spire of St. Martin's Church in the background, and the fountains playing in the sunlight.

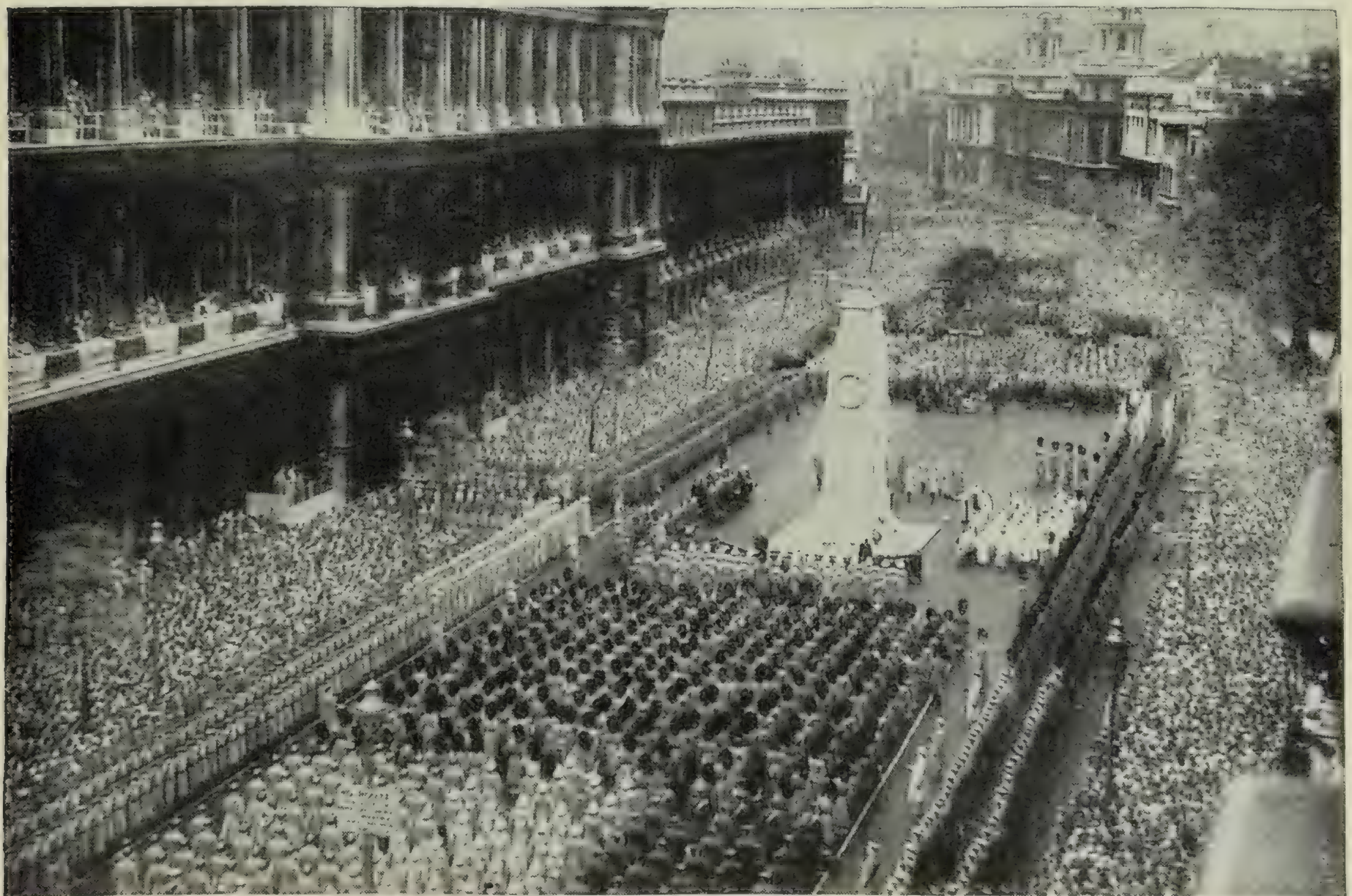
WHITEHALL—THE OLD PALACE—WHERE KINGS USED TO LIVE IN OLDEN DAYS.

Out of Trafalgar Square leads Whitehall, a name which makes us think of Cabinet Ministers and Members of Parliament, and all the people who spend their days in the difficult task of governing the wide lands over which

THE MAJESTY AND DIGNITY OF LONDON TOWN

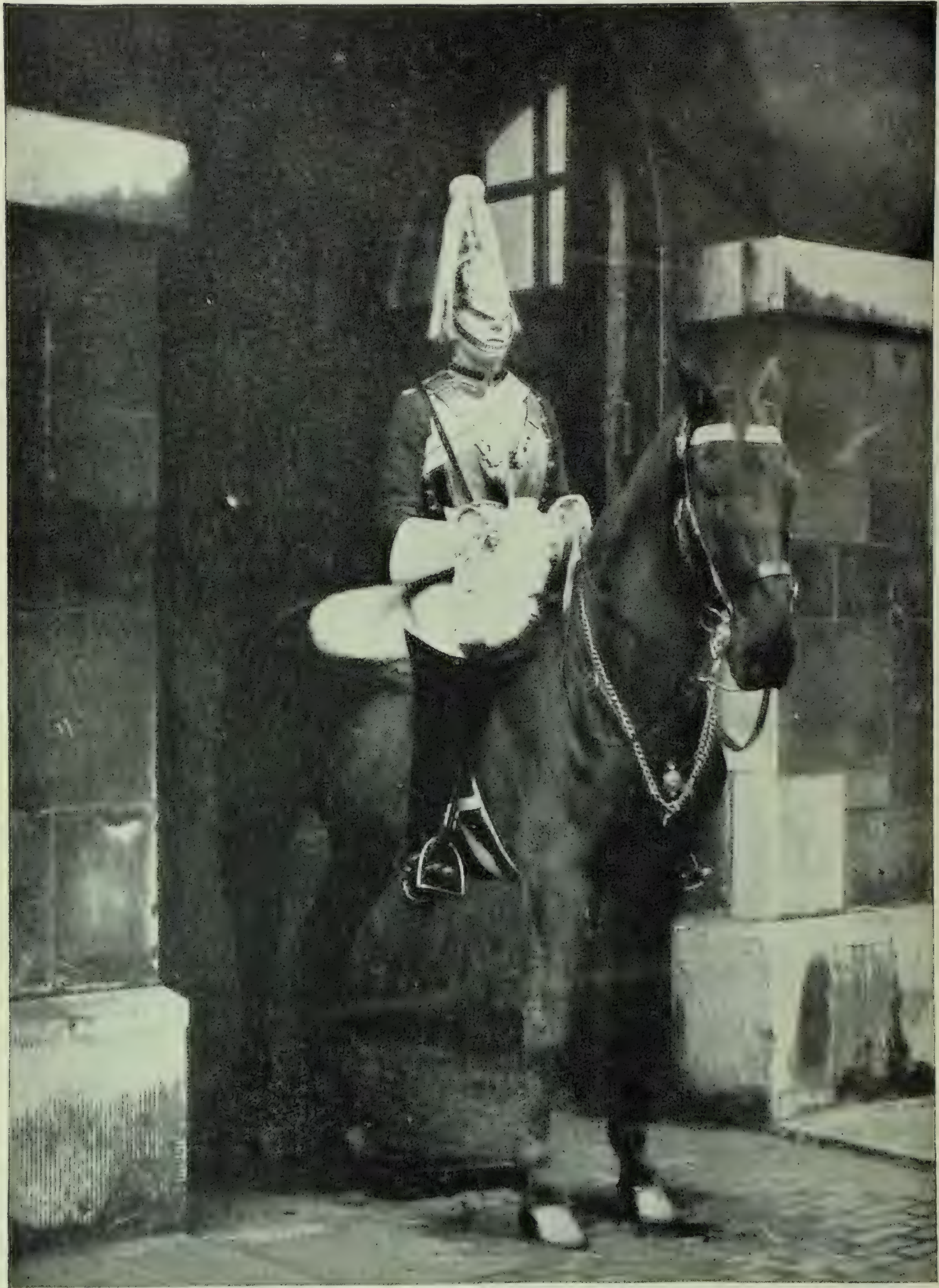


Here is the Bank of England, the store-house of the world's treasures. In the safety of the vaults vast amounts of England's money are kept secure. The Royal Exchange, another of London's famous buildings, is facing it. [*E.N.A.*



Londoners turn out in reverence to honour the warriors who lost their lives in the Great War. This picture gives a striking general view of the ceremony on Armistice Day at the Cenotaph in Whitehall. It was taken with the new infra-red photographic plate. It is an impressive sight to watch those silent thousands. [*Topical*

THE SENTRY AND HIS MOUNT ON GUARD



Visitors to London flock in crowds to watch the changing of the Horse Guards at Whitehall. It is a fine sight to see how even the horses stand rigid, hardly blinking an eyelid, as though conscious of the dignity of the moment. The picture shows a Horse Guard on sentry duty in his handsome uniform and plumed helmet. [*Topical*

A view of the interior of the Great Hall at the Guildhall, where many banquets are held, showing Nelson's monument on the left. This famous building was erected in the fifteenth century and was partly destroyed by the Great Fire.
[E.N.A

King George V. rules. A little way down Whitehall is the old Palace of Whitehall, where once the Kings of England lived. You can still see the long window from which Charles I., the only King of England who was beheaded, stepped out on to the scaffold. At the entrance to the palace two mounted guards are always on duty. Most people stop to look at them, for they are a fine sight, especially the Life Guards, mounted on their black horses, with their gleaming breastplates and helmets, and flowing white plumes.

WHY IS NO. 10 DOWNING STREET A FAMOUS ADDRESS?

Beyond the palace there are many stately buildings which are government offices, and tucked in among them is the little street called Downing Street. We must stop to look at the simple house numbered 10. It is one of the famous houses of the world, for it is the official residence of the British Prime Minister. In times of excitement the narrow street is packed with people waiting to see ministers come and go to No. 10, and the good-natured London policemen have a busy time moving them on.

Near the entrance to Downing Street is the Cenotaph, England's memorial to the men who died in the Great War. The foot of it is always heaped with flowers, but never more so than on Armistice Day, when people gather there in thousands for the two minutes silence. This beautiful memorial to the men who died for freedom is well placed in Whitehall, close to the Houses of Parliament, where the people who claim to be the freest in the world carry out the business of governing themselves.

THE HOUSES OF PARLIAMENT, WHERE THE AFFAIRS OF STATE ARE SETTLED.

Let us go now to Parliament Square. On the green in the middle are statues of great Victorian statesmen, only a few of the many statues with which London abounds. Canning and Peel, Palmerston and Disraeli are there, and in a little enclosure to one side stands the statue of one of the world's great men, the United States president, Abraham Lincoln. On one side of the square are the Houses of Parliament, and the tall tower in which hangs Big Ben, whose deep ringing tones so many of us hear every night on the wireless. Everybody who comes to London wants to go inside the Houses of Parliament to see the two big chambers, with their rows of leather-covered benches, where Lords and Commons meet to make the laws and debate about the government of the country. In the House of Commons our attention is attracted by Mr. Speaker's chair, and the big table on which is laid the mace, the sign of his authority. While in the House of Lords the centre of interest is the dais at one end of the chamber on which are the thrones of the King and Queen. There are many other rooms in the

Here is a striking view of Westminster Abbey, where many ancient shrines and statues are to be found. Thousands have come to this beautiful building to pay homage to the Unknown Warrior, who is buried there.

Houses which visitors cannot see, ministers' private rooms, committee rooms, a dining-room and kitchens (for even Members of Parliament must eat), and a smoking-room where members can rest when they are not wanted in the House. All visitors can see St. Stephen's Hall, where members met when Parliament first began over six hundred years ago, and the little chapel in which members have the privilege of having their babies christened; and no visit to the House of Parliament is complete without seeing the terrace by the river, where in summer Cabinet Ministers entertain famous people from all over the world, and you yourself might have tea if you were invited by your Member of Parliament.

THE ABBEY WHERE THE UNKNOWN WARRIOR SLEEPS.

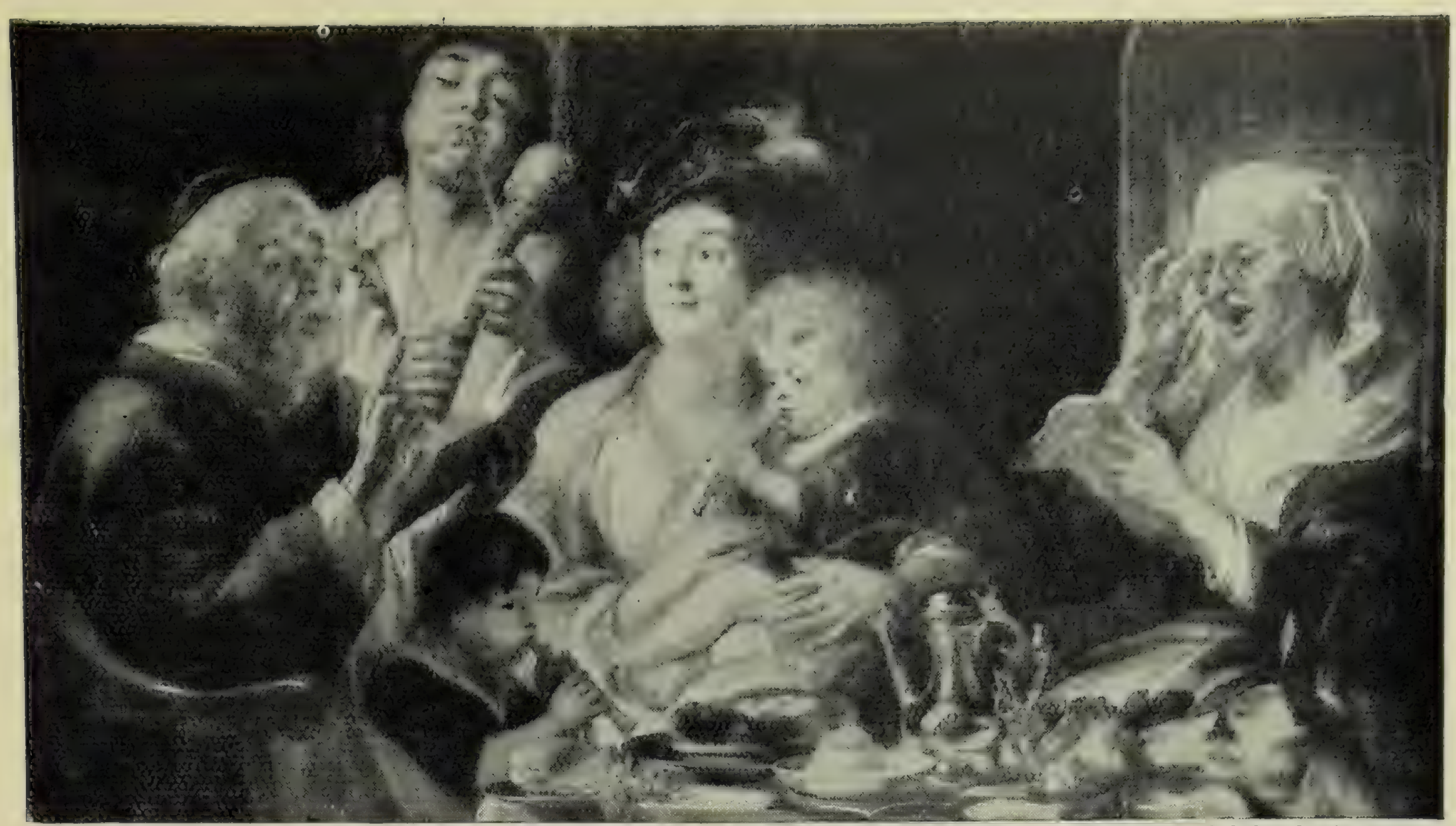
Near the Houses of Parliament is another of London's famous churches, Westminster Abbey. Like St. Paul's, it is the resting place of many famous men, but particularly of great poets and writers, whose monuments are to be found in the south transept, called the Poets' Corner. Westminster Abbey is far older than St Paul's, and some people think it more beautiful. It is, indeed, one of the most beautiful churches in England, with its high-pointed arches and its glowing, stained glass windows. Because it is an old monastic church it has a lovely chapter-house, and cool cloisters, through which we can go to one of England's famous public schools, Westminster School.

Tucked away from the bustle of the buses, cars and shoppers, in the quiet of Bloomsbury, stands the imposing building, the British Museum. Here is the world's greatest library—over four million books—and here also may be seen precious relics of olden days and of other lands. The Natural History and Science Museums in South Kensington are also worth many a visit.

A GLIMPSE OF THE NIGHT-LIFE OF DEAR OLD LONDON

These are some of the sights we all want to see when we come to London, and they are familiar friends to those of us who live in London. They help to make us love London, because they remind us of our heritage as English men and women. But there are many other simple things of our daily lives which make us love it even more. There are the plane trees and the cheeky London sparrows, the street sellers, with their barrows piled high with fruit and flowers, the pavement artists and the men who wind up their mechanical toys and set them going on the pavement right under our feet. And at night London is a fairy city. All down the long streets the tall standard lamps gleam in long succession ; in Piccadilly Circus the electric signs twinkle in and out in myriad colours ; theatres and picture houses and shop windows are ablaze with light.

Some of us love dear old London best at night, while others love her in the early morning, when the streets are swept and clean, and the fresh winds blow from the river. So beautiful is London then that Wordsworth said of her, " Earth hath not anything to show more fair." And others of us love her best in the dusk of a winter evening, when the bare branches of the trees are outlined against the delicate pink of the sunset sky, and the lights creep out one by one, and the busy workers are going home to their cosy firesides. But whether it is day or night, dusk or dawn, the big city calls us all, for, as an English writer has said of the metropolis, London is " the family sitting-room of the English-speaking peoples."



" The Family Concert," by J. Jordaens, shows every one, from the baby to grandma, and grandpa joining in the music. [*Rischgitz*

THE STORY OF MUSIC

Do you know the difference between noise and music? How did we come to distinguish between the two and discover how to place beautiful sounds together so that they make up a musical composition? This section will tell you all about the development of music, and how the different musical instruments originated. Interesting tales of the lives of composers, whose music still holds us enthralled, can also be read. You will appreciate their works more if you learn how they were composed, and how the different masters came to reach fame in the world of music.

DURING the Great War, groups of negro labourers could often be seen at night, round a fire, beating an assortment of tin cans, with evident pleasure to themselves. To others the effect was anything but welcome, for what they heard was a series of noises and not musical sounds. How are these latter made? Pluck a tightly stretched string. It moves regularly backwards and forwards, and if these movements are quick enough a musical sound is emitted. Shorten the string and the movements (vibrations, we can call them) are quicker and the note which is given out is of a higher pitch.

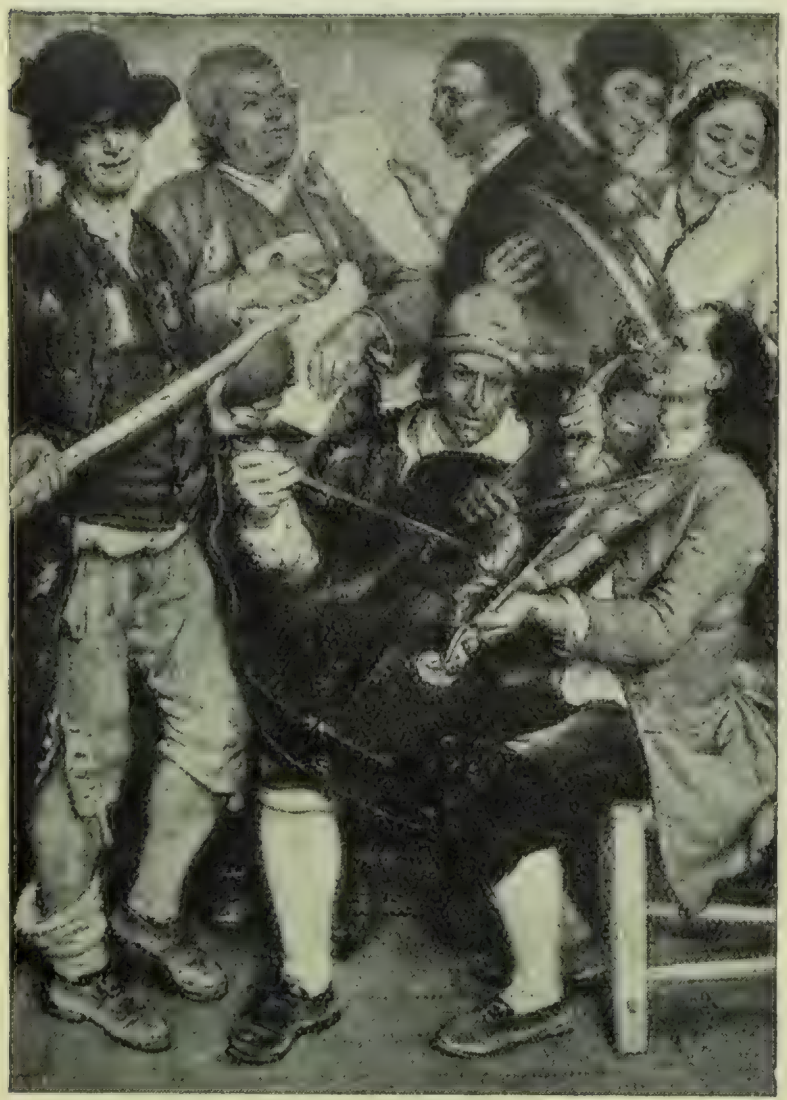
Try another method. Take a key and blow across the open end. A whistling sound is produced. Do the same with a key of different length. A different sound is produced. You have got in these two simple experiments the origin of two classes of musical instruments, the stringed instruments and the wind instruments.

Interesting accounts of the origin of instruments are to be found. The Greeks have a story of their god, Hermes, discovering near the Nile a dead tortoise whose softer parts had dried and formed something like strings attached to the shell. Here was a primitive lyre or harp. This seems to suggest that the harp originated with the Egyptians, though it is probable that they adopted it from Assyria or Babylonia.

The second class of instrument—the wind instrument—is said to have taken its rise in Greece.

It is said that the water nymph, Syrinx, when pursued by Pan, was saved by her sisters, who changed her into a reed. Pan, however, cut this reed into a number of pieces, joined them with wax, parallel to one another, in decreasing lengths, and produced an instrument which has recently become popular with children, the Syrinx or Pan's pipes. In pictures of Greek life shepherds are often shown using one of these instruments.

Turn to the Bible and in the fourth chapter of Genesis, verse twenty-one, you read, " And his brother's name was Jubal: he was the father of all such as handle the harp and organ." Probably these two instruments are



This picture of tramping musicians is a fine study in expression, from the ecstasy of the violinist to the set face of the 'cellist, who is absorbed in the music. [*Rischgitz*

just the lyre and Pan's pipes of which the Jews had learnt from other nations.

HOW DO WE KNOW THAT SINGING AND PLAYING WERE POPULAR IN OLDEN DAYS ?

But music can be made by a natural instrument, the voice. It is probable that man could sing almost as soon as he could talk, and the way would be shown by the songs of birds.

A closer study of the Bible shows that the art of music, both singing and playing, was fairly well advanced in the days of the Hebrews.

David is represented as a harpist of no mean skill. He knew what the effect of music was on depressed people. Read the wonderful poem by Browning on Saul, and you will see how David's music was the best medicine to rouse Saul from his trance.

THERE ARE MANY CURIOUS MUSICAL INSTRUMENTS MENTIONED IN THE BIBLE.

A most interesting portion of Scripture dealing with music is the Book of Psalms. The last psalm gives an account of the instruments used, the psaltery and harp being stringed instruments, the trumpets and organs wind instruments, while the cymbals and timbrels (hand drums) are what is known as percussion instruments.

Much is learnt from the Psalms of the guilds of Temple singers. The sons of Korah, mentioned in Psalm forty-four and many others, were a guild of Levite singers connected with the Temple. The chief musician, mentioned so frequently, was probably the conductor of the Temple choir, while some of the queer names at the beginnings of the Psalms evidently refer to the music to which they were sung or to the type of composition.

HOW DID MUSIC COME TO BE INTRODUCED INTO CHURCH SERVICES ?

During the Middle Ages, that is, from A.D. 300 to A.D. 1500 (roughly), we find that music was being used increasingly in church services. Thus we can see why the church had such an influence in the development of music.

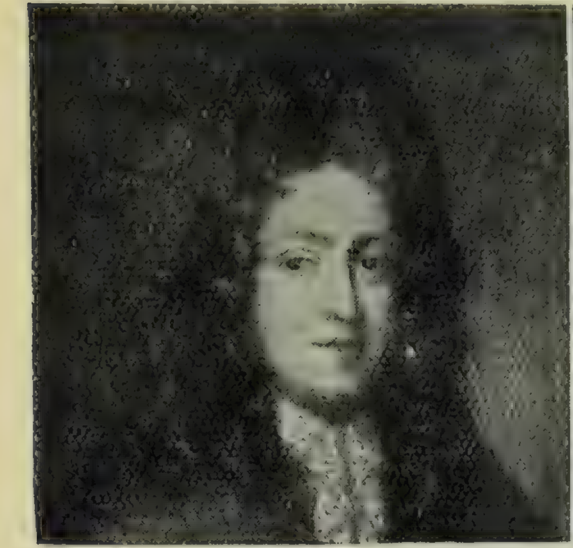
In the first place the Church helped to develop what are known as the scales, or successions of notes employed. In early times our ancestors had come to recognise that certain sounds were alike, but that one was higher or lower in pitch than the other. The distance between such two notes (interval it is called) is now known as an *octave.*

Later, the octave was further divided into intervals, until twelve equal steps or degrees filled up the whole. This was a scale. Musicians called it a *chromatic* scale. Another way of dividing the octave was by using six equal longer steps. A third scale consisted of a mixture of large and small steps and was known as a *diatonic* scale, of which two chief kinds now remain, the major and the minor.

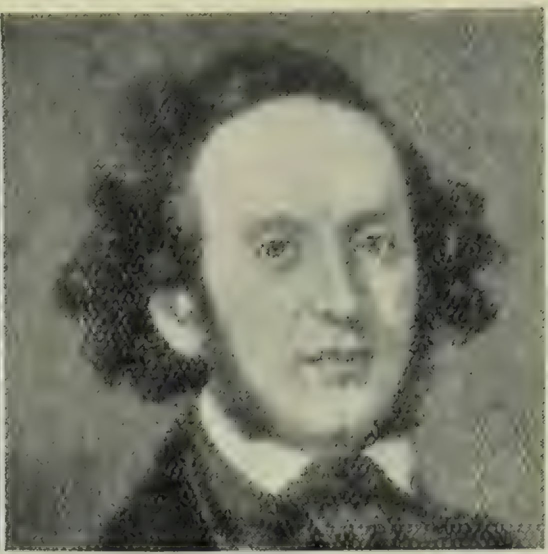
Ambrose, Bishop of Milan from A.D. 374 to A.D. 397, helped to develop these scales, as also the great pope, Gregory the First, is said to have done. It was this pope who saw the fair-haired Saxon boys in the market-place in Rome and resolved to convert our land, which he attempted to do by sending St. Augustine.

Organs, the forerunners of our modern organs, were used in connection with the church music. To play these, flat pieces of wood called keys were struck by the performer. These keys were large, like those used in playing the bells in some of the present day Continental belfries, each key having to be struck with the fist. Thus all that could be done was to play the notes that formed the tune or melody, and harmony was impossible.

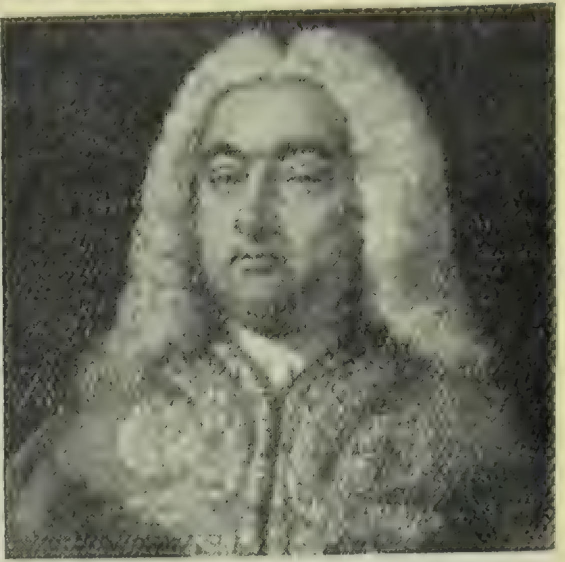
THESE TWELVE MEN GAVE US IMMORTAL MUSIC



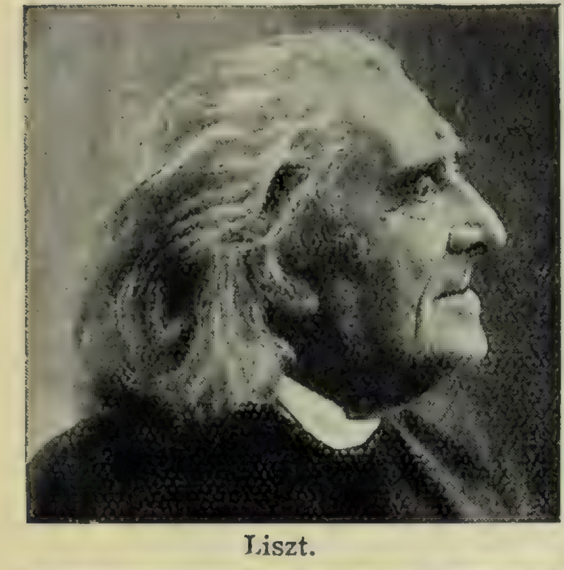
Purcell.



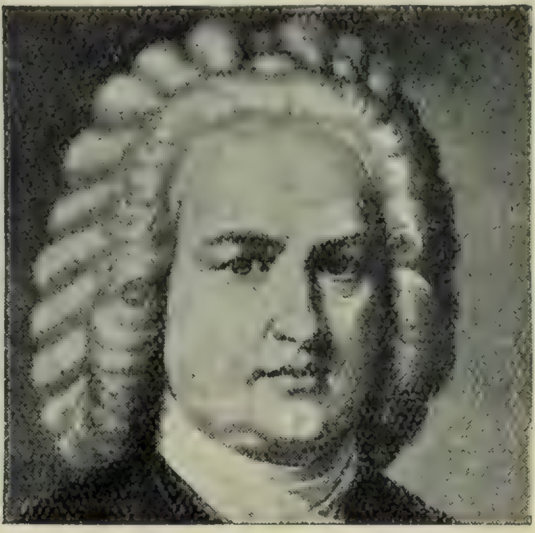
Mendelssohn.



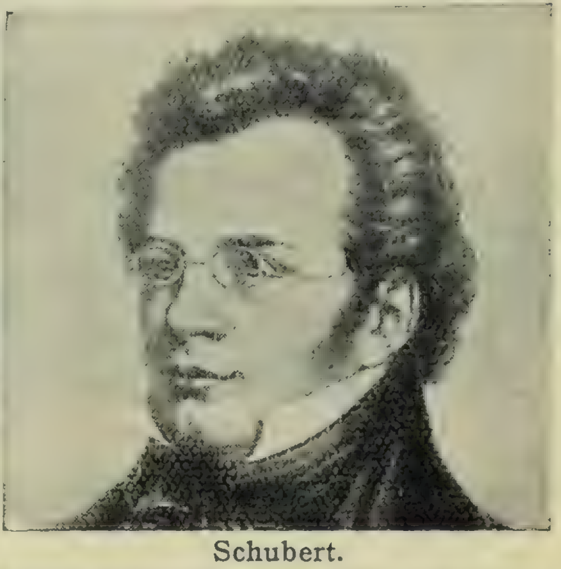
Handel.



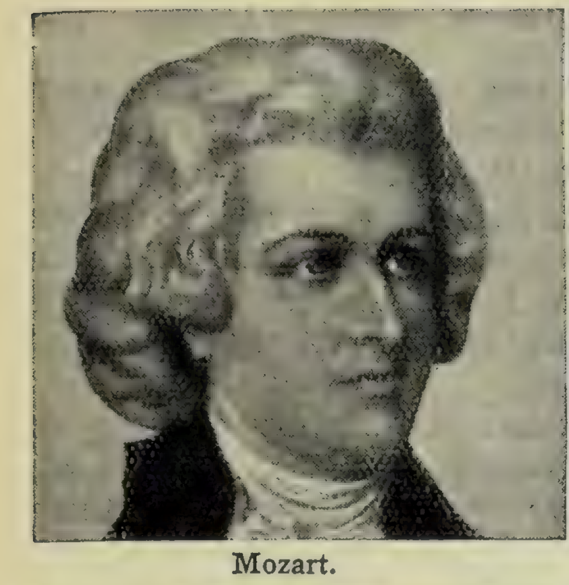
Liszt.



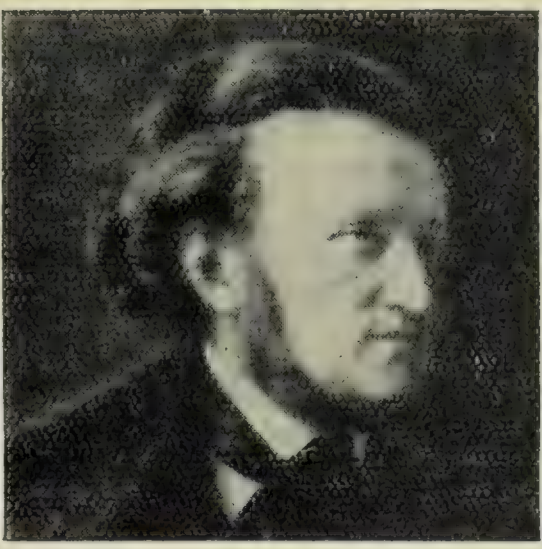
Bach.



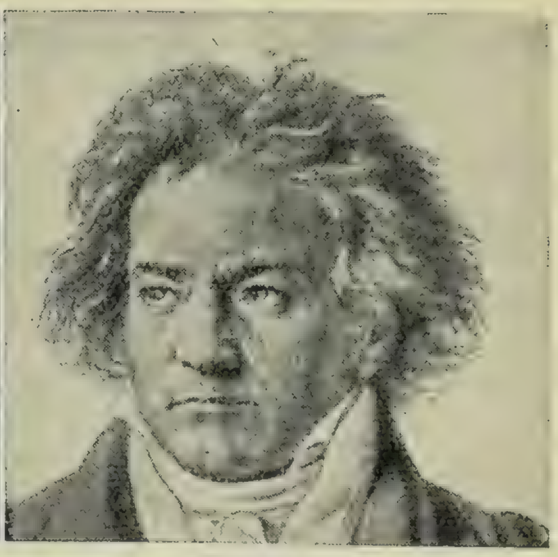
Schubert.



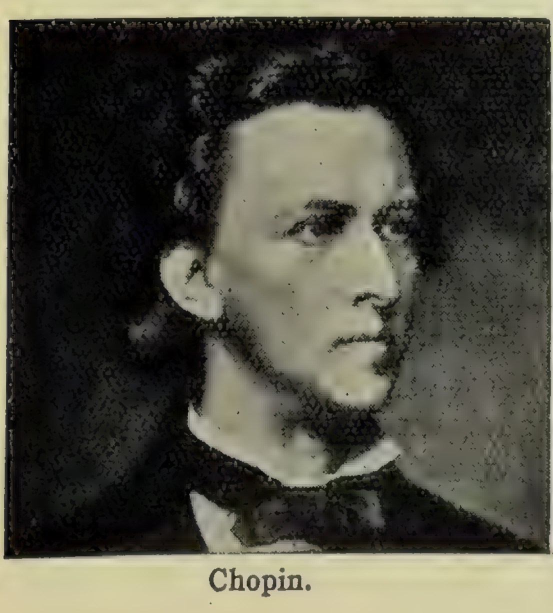
Mozart.



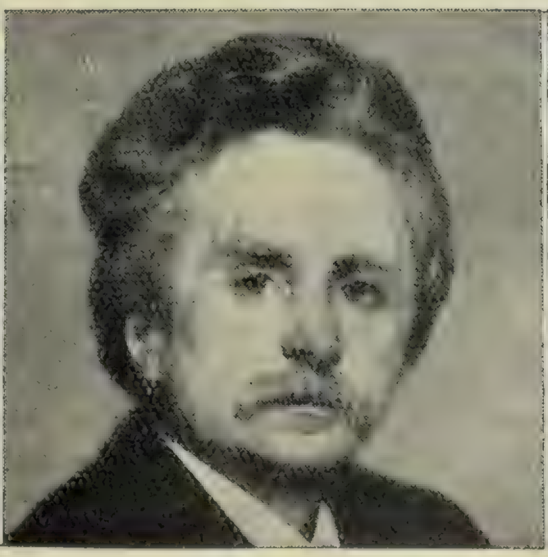
Wagner.



Beethoven.



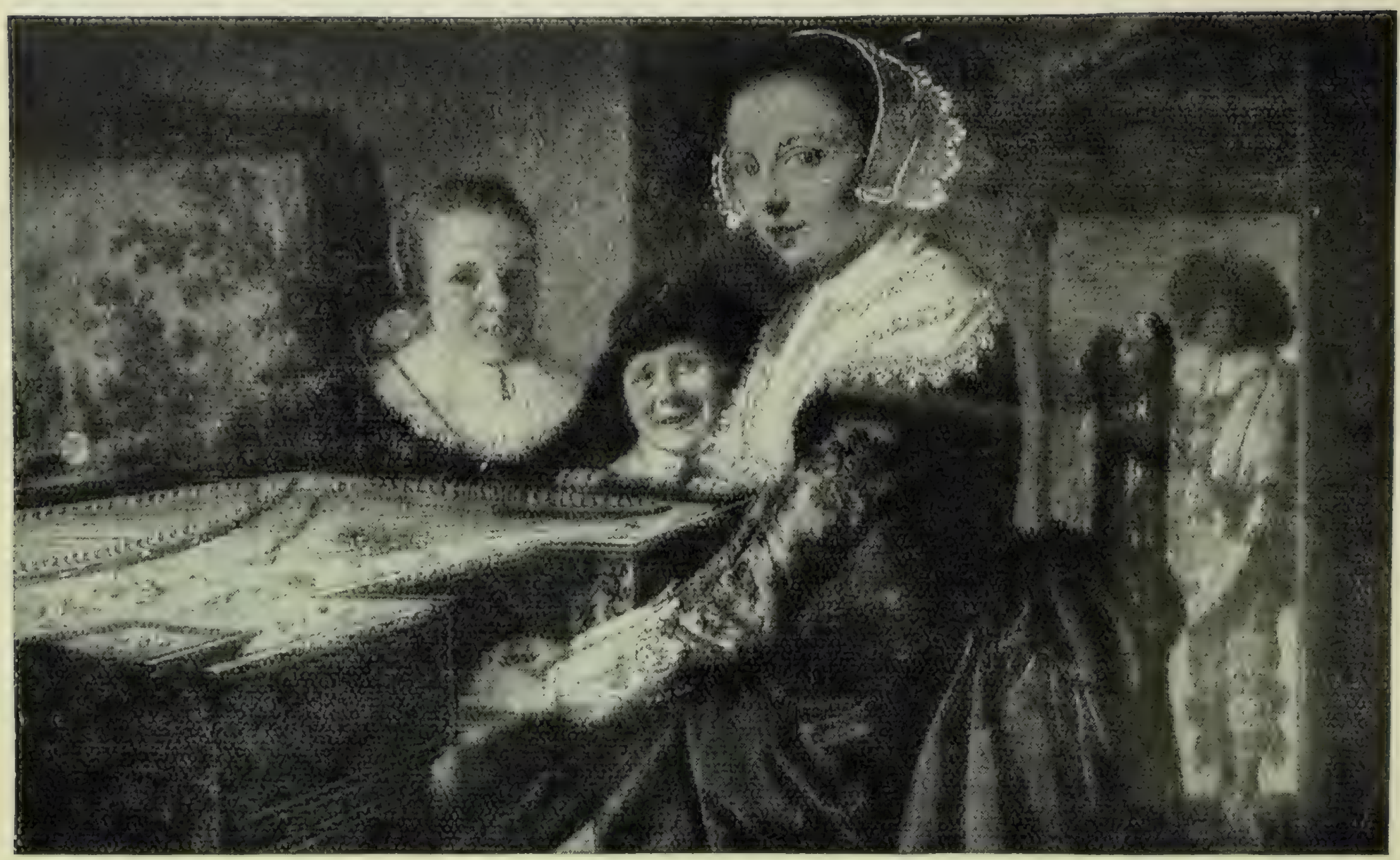
Chopin.



Grieg.

Sullivan.

[*Rischgitz*



This Dutch painting shows the lady of the house seated at her instrument, providing music for an admiring family.
[*Rischgitz*

THE DEVELOPMENT OF HARMONY IN MUSICAL EXPRESSION.

Next we get a double melody where notes of equal length, in intervals of fourths or fifths or octaves above or below the melody, are played at the same time. Then notes of different length from those of the melody were used to accompany it, and we are not far from the stage when we get harmony, or the combining of several notes with the melody to form pleasing sounds.

One difficulty which had to be solved was the writing down of these melodies. At first letters were used. Later a system of dots, dashes, curves and hooks, at differing distances above the words to be sung, made its appearance. In the end we get the stave which is very generally used to-day, and the now familiar notes, such as minims and crotchets, which represent the duration of the tones.

A recent and simplified form of writing music is Curwen's Tonic Sol-fa method, which is intended to do away with certain difficulties met with in the ordinary system. It is useful, but cannot take the place of the older system.

Although most of the music of the Middle Ages was connected with the church yet there was another kind. Bands of roving minstrels called troubadours wandered up and down the countries of Europe, especially Southern France and Spain, singing songs or ballads somewhat resembling the folk songs which have come down to the present day.

THE ITALIAN WHOSE MUSIC DELIGHTED THE POPE.

In the early part of the sixteenth century the great Protestant reformer, Luther, introduced chorales, which were something like our modern hymns; while for the Roman Catholic Church an Italian called Palestrina wrote beautiful music that so pleased the Pope that he gave him control of the music at St. Peter's, Rome.

During the sixteenth century we hear of new instruments, especially the harpsichord, which was a stringed instrument something like a piano, with the exception that the strings were plucked by quills instead of being struck as in a modern piano. Another instrument closely resembling the harpsichord was the virginal, so named from its being a suitable instrument for maidens.

HOW THE OPERA AND THE MUSICAL DRAMA CAME INTO BEING.

England played its part in this century, and one noted name was Tallis, whose famous "Canon" is to be found in most hymn books of to-day. Another was Byrde, a skilful performer on both virginal and organ. He wrote anthems still sung in our cathedrals, and also composed some very beautiful madrigals, or, as we should call them, part songs or glees.

In this century changes took place which led to new kinds of music, the opera, or musical drama, and the oratorio, or sacred musical drama. One of the great names in connection with these changes was that of Monteverde, who wrote opera as well as church music.

It is also during this period that instrumental music becomes important for its own sake and not merely as a means of accompanying voices. Pieces were composed for instruments alone, either solos, often in the form of sonatas, or symphonies to be played by the whole orchestra, or concertos where one solo instrument, such as the violin, is accompanied by the rest of the orchestra.

Of the changes in instruments during the century perhaps those connected with the violin are the most interesting. Besides receiving their modern shape violins were improved beyond recognition, until those produced by the Stradivari family are without rivals.

A glance at England in the seventeenth century shows a curious change at work. Under the Puritans music was discouraged, but with the restoration of Charles II., in 1660, back came music with new vigour. It is at this time that we hear of Henry Purcell, whose work for both vocal and instrumental music is one of our priceless heritages.

THE YOUNG GERMAN BOY WHO JOINED A BAND OF STROLLING MUSICIANS.

We are now transported into the centre of Germany, to the little town of Ohrdruf in Thuringia. Here a small boy is working away night after night whenever there is moonlight, copying out some music from a book, which had been forbidden him because of its difficulty. After six months' labour his work was discovered—and destroyed by a heartless brother. This young musician was John Sebastian Bach, one of a band of German musicians who were to make the eighteenth century such a noted time for music.

A wonderful performer himself, Bach wrote down the pieces he played, and many of these are even now unsurpassed in their kind. Many music lovers go year after year to our big churches to hear his "Passion Music." Few present day organists are unacquainted with his fugues, compositions of amazing skill, as will be realised by any who know the plan on which they are written. To get a simple idea of a fugue, turn in Handel's *Messiah* to the chorus, "And with His stripes we are healed." Notice the skilful way in which the four sets of singers, treble, alto, tenor and bass, sing the same tune one after another and not always on the same notes. A fugue is built up something after this fashion.

THE FAMOUS COMPOSER WHO PLAYED THE HARPSICHORD IN AN ATTIC.

We are now going to Halle, a town not many miles from that in which Bach was copying out his music by moonlight, and we here discover another boy struggling to learn music in far worse circumstances. We see him practising on a harpsichord which a friend had smuggled into an attic for him. The tinkle of this little instrument would not be heard behind closed doors, but we can imagine the boy's heart beating fast lest he should be discovered, for his father wanted him to be a lawyer, and thought music a waste of time. This boy, born in 1685, the same year as Bach, was destined to become even more famous than the great fugue writer. He was George Frederick Handel.

Another story is told of his determination to learn what he could of music. Hearing his father was about to visit a son who was a servant of a neighbouring Duke, the boy decided to run after his father's coach so that he could hear some of the wonderful music at the Duke's court. The way, however, was long and muddy and George had at last to cry out for help. He was taken, probably not without scolding, to the Duke's court. Here his skill in music was discovered, the father was persuaded by the Duke to agree to the boy's wishes and he was taught music.

HOW HANDEL ENDED HIS DAYS BLIND AND IN POVERTY.

On the death of his father he determined to earn his livelihood by music, and was soon seen in Hamburg, where his career almost ended. He quarrelled with another musician, and a duel followed in which Handel was saved by a button. What a loss to the world there might have been!

After journeying in Italy, Handel came to England, which he made his home. In 1714 he saw his old master, the Elector of Hanover, whom he had previously deserted, come over to be King George I. of England. Handel feared his career would be ruined, but the monarch pardoned him and actually gave him a pension.

Handel's fortunes ran smoothly for a time and then misfortune overtook him. He became bankrupt, suffered from the envy of others, and finished his days like Bach, blind.

Of his works many remain popular even to-day. One famous tune, a favourite with performers on the pianoforte, is *The Harmonious Blacksmith.* This tune, which was written for the harpsichord, was suggested, some say, by his hearing a blacksmith singing at his work. He also wrote anthems and opera, but most people probably think of him as a composer of oratorios and especially of *The Messiah.* This was first produced in Ireland in 1742. One writer says that the crowd assembled to hear this work was so great that " ladies were requested not to come in crinolines."

In 1743, when *The Messiah* was performed in London, the whole audience was so carried away by the wonderful Hallelujah Chorus that they rose, the King amongst them, in honour of the composer.

THE YOUNG GERMAN WHO PRACTISED HARD TO WIN FAME AS A MUSICIAN AND COMPOSER.

Our next glimpse into the lives of these great German musicians is made at Bonn, a small town on the Rhine. Here we see a small boy practising hard on a new instrument, the pianoforte, a boy who became perhaps the greatest musician the world has known—Ludwig Van Beethoven. By his skill in playing at an early age he astounded the great German composer and performer, Mozart. Later he studied for a time under another famous German, Haydn. Most of his work was done at Vienna, where he was welcomed by many people of the highest society. He was often rude to them, but this was pardoned because of his wonderful gift of charming his hearers by his playing. Some excuse may be found for his rudeness, for he became deaf at quite an early age. It is possible that his death, which took place in 1827, was hastened by the ingratitude of a nephew for whom he had made great sacrifices.

Although he wrote many kinds of music, it is generally in connection with instrumental music that we think of " The Master." His giant symphonies were works of enormous labour. Music inspired him, but that did not set him free from the immense tasks of writing out the parts for the various performers in these works.

But Beethoven is perhaps best known to young people by his sonatas for the pianoforte. This instrument, whose name can be translated " soft-loud," differed from the harpsichord in that its strings were struck by " hammers " and not plucked by quills. Both were played by the fingers striking keys, but with the pianoforte it is possible to play either soft or loud at will, by varying the pressure on the keys. The pianist can put expression into his playing through his fingers just as the violinist can do it through his bow.

If any one of Beethoven's sonatas stands out above the rest it is perhaps the Moonlight Sonata. At the beginning of this piece is a very brief dedication " To the Countess Julie Guicciardi." She was his pupil, and if fate had been kinder to him she might have been his wife. But, like Handel, he was never married, and so he threw his undivided energy into his music, producing work after work unceasingly.

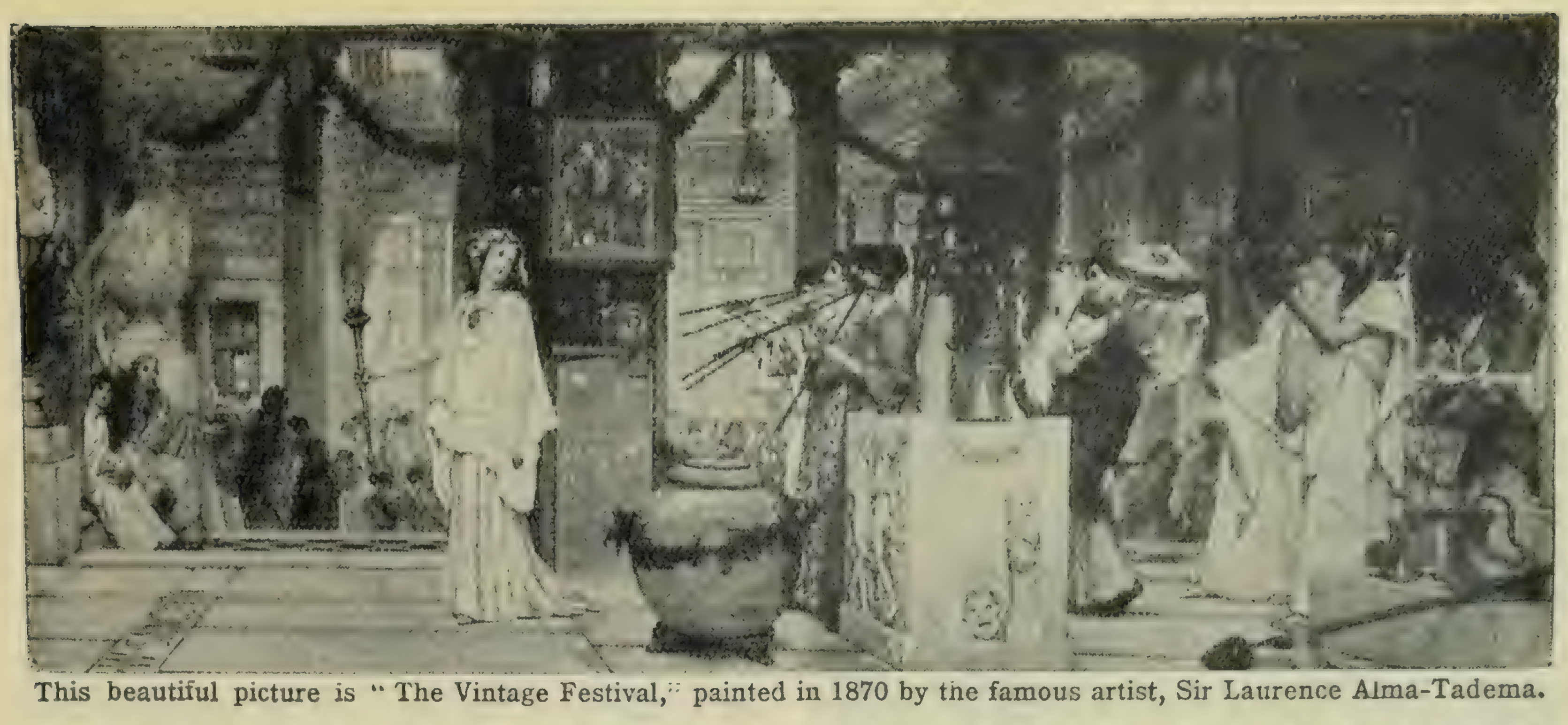
It is said that one of the torch-bearers at Beethoven's funeral was Franz Peter Schubert, whose name brings up to our minds his songs. There had been songs before this time, but from his day songs were vastly improved.

Another famous name in connection with the composing of songs was Mendelssohn, but his were songs without words. English people also remember him for his wonderful oratorio, the " Elijah."

Still another German name stands out prominently, Wagner, the great writer of opera. But every country has its notabilities, and it is pleasing to see the smaller countries adding their little to our sum of musical happiness. While England rejoices in Sullivan and France in Berlioz, Norway can produce its Grieg and Poland its Chopin.

HOW JAZZ AND OUR MODERN MUSIC CAME INTO BEING.

Great changes are taking place at the present time. Much music is being composed and played, but some of the changes have alarmed serious-minded people. First there is the clever yet monotonous jazz music, which is still popular in spite of the hard things which have been said about it. Then we have wireless, which has brought music, good and bad, into practically every home. But what is perhaps not so pleasing is the thought that there is less music actually produced there. We hear also of the lack of organists, while orchestras are having a great struggle to keep alive. Choral societies, brass bands and hand-bell ringers are by no means as flourishing as they were a quarter of a century ago. Men have laboured to build up our musical heritage, and it would be a calamity if we should throw away what has been and still ought to be one of the greatest and most satisfying of *man's inspirations.*



This beautiful picture is "The Vintage Festival," painted in 1870 by the famous artist, Sir Laurence Alma-Tadema.

BEAUTY FROM MAN'S HANDS

The story of the development of painting and sculpture through the ages is a wonderful tale of man's endeavour to show beauty and grace of form. We can but touch on such a vast subject here, but many famous paintings and sculptures are reproduced in this section so that you may study them for yourselves. If there are art galleries in your own town and those nearby, you would do well to visit them often and study the pictures and pieces of sculpture. Often a picture that does not seem to have much of interest in it at first sight becomes more beautiful to you each time you see it. Try sitting before a famous painting and examining it in great detail. Then go to your library, take out a book dealing with the painter's life and work, and find out if your ideas correspond with those of the writer.

EARLY man amused himself by drawing crude outlines of animals on the walls and floors of the cave in which he dwelt, using just the same tools as he employed for his work. Our earliest existing examples of art are rough sketches of bison, oxen, deer and similar animals. Man found that this carving and drawing gave him delight while bringing pleasure to his fellows who chanced to notice it, so he tried to improve his methods and tools, and to widen his choice of subject. He now commenced to draw other men, his home, his outdoor surroundings, even events which happened often and impressed him. Naturally, the more he practised these things, the cleverer did he become in doing them; and it is from such a simple beginning that art was brought into the world.

The oldest race who made beautiful things—things which, after some thousands of years, still attract men by their loveliness—is the Egyptian. During forty hundred years, perhaps longer, this ancient country was highly civilised and, from about 3000 B.C. onwards, created splendid works of art.

From the tombs of the Egyptians, numbers of which have been excavated in recent years, we are able to reconstruct the daily life of all classes of this people accurately and with minute detail.

The walls of the tombs were covered all over with paintings describing the occupations, the hobbies, and the social circle of the particular man, woman or child for whom they had been prepared. One reason for doing these wall paintings was that it was realised by the relatives of the dead person that the habit of bringing food and drink to him could not be kept up forever, so they thought that if food and servants and kitchen utensils were painted on the walls the "ka," or double (that is the usual name of the portrait statue), would be preserved from perishing through starvation. Often these paintings showed scenes such as men ploughing; the harvest being gathered in; farm boys milking cows and driving the cattle to the fields; men hunting lions with spears and netting birds; scribes making invoices of goods; chess players enjoying a hard problem; musicians playing harps and flutes; and there is one you would find very amusing showing a battle between cats and rats!

In addition to paintings, bas-reliefs (carvings where the subject stands out a little from the background) were frequently worked on walls. The designs, in early days, were first drawn in

This bronze statue of an athlete throwing a discus is the work of Myron, one of the earliest Greek sculptors. Note the splendid physical development of the figure.

black or red ink, sometimes in detail (either freehand or on squared lines to get the proportions correct), or another method was simply to indicate the design with a few rapid strokes of a reed-pen. Next the artist chipped all round the outline with a hammer, or else carved it with a chisel, so that it stood out prominently from a flat background, having the effect that you see in modern relief work. Both bas-reliefs and statues were always coloured (except when a material of a natural colour as red granite was used), often in red, blue and gold, but about fifteen colours were in use. The Egyptians, because they lived in a very sunny country, loved many and bright colours, and they learnt how to blend shapes to produce beautiful effects. The themes selected for these reliefs were all the events of ordinary life. Specimens of these may be seen at the British Museum, and in other big museums.

HOW ART REACHED A HIGH STANDARD IN EGYPT AND GREECE.

One of the most outstanding features of the art of Egypt is that it was able to paint or sculpture any person or object very accurately; and another point is that out of the hardest materials, as diorite and granite, it acquired that great technical ability which enabled it to make statues having accurate bodily structure and delicate, supple features as if a soft substance such as wax were being moulded. This was a very great triumph of the Egyptian artists.

Now we will turn to another country, namely Greece, whose art, in its beginnings, was influenced by that of Egyptian masterpieces.

It was not until the seventh century B.C. that Greece began to produce great painting and sculpture. After this she continued to develop, and finally to decline, during a space of about five hundred years. When she was conquered by Rome, her art became merged into that of the victorious nation.

WHERE TO FIND PARTS OF THE ANCIENT ROMAN BUILDINGS.

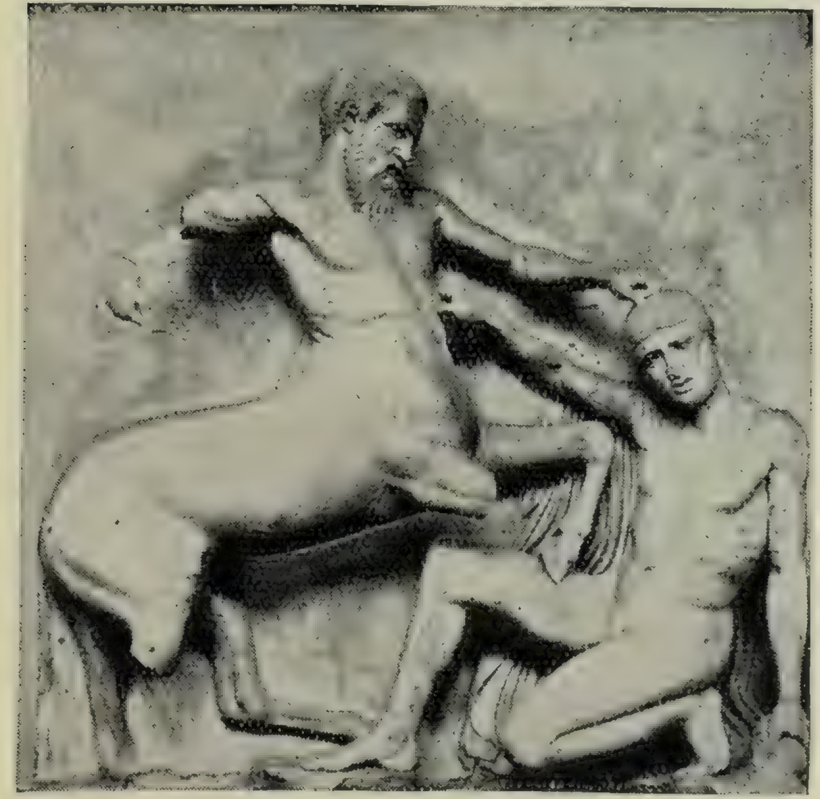
When you happen to be within reach try to go and see some fragments of the Greek buildings and sculptures. In our own British Museum there are portions of the Parthenon, the most beautiful building ever constructed. It was a wonderful temple erected in honour of the goddess Athena, the special patroness of the city of Athens, and the sculptor who

The wonderful statue of Hermes is by Praxiteles, the famous Greek sculptor. His fine modelling, beauty of line and expression won fame for him in the world of art.

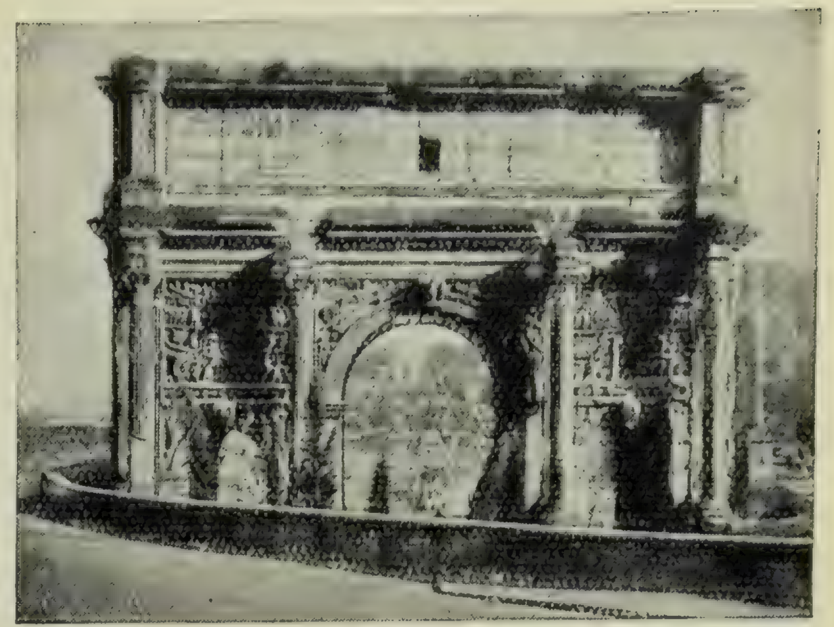
designed it was the celebrated Pheidias, the greatest sculptor of all time. The surpassing beauty of the Parthenon was due to the perfect proportions of each of its parts, and to the marked rhythm of the scenes and figures, which satisfy and please us as does the metre of a poem.

THE BEAUTIFUL FRIEZE DECORATED WITH MANY WONDERFUL FIGURES.

Round the temple was a frieze (a horizontal strip of wall decoration), extending for 524 feet, in which we have a picture of the entire social life of Greece and of her religious customs ; for the event represented is the yearly procession of the citizens of Athens to give Athena, their protectress, a new garment. In looking at the pieces of this frieze still in preservation we are amazed at the charm and gracefulness of the figures. The simplicity and homeliness of the scenes depicted belong to every age and land and appeal to every one. We can see the powerful Athena, with her long hair hanging loosely down her back and her helmet removed, sitting completely at her ease and talking with Hephaestos ; then there are Zeus and Hera, his wife, engaged in some absorbing conversation ; Ares, or Mars, has made himself comfortable, having one leg drawn up with his hands clasped round it and his back in a lazy attitude. The gods and goddesses are true men and women, only marked out by their greater size. In this long procession there are priests, magistrates, girls carrying food and bowls ; boys with wine jars on their shoulders, musicians playing their instruments, cows and sheep for sacrifice, and chariots drawn by four horses : no one is left out of this important happening of the year. The north side of the frieze has a procession of cavalry, which is the very finest sculpture of this kind in the whole world. It is done so well that you can see the horses trying to gallop, and the riders straining hard at the reins to hold them in check !



The contest of Centaur and Lapith—part of the celebrated sculptures at the Parthenon, Athens. Pheidias, who designed it, has been called the greatest sculptor of all time, although he ended his life in disgrace. [*British Museum*



The Arch of Severus is a fine example of the triumphal arch so dear to the Roman sculptor in olden days.

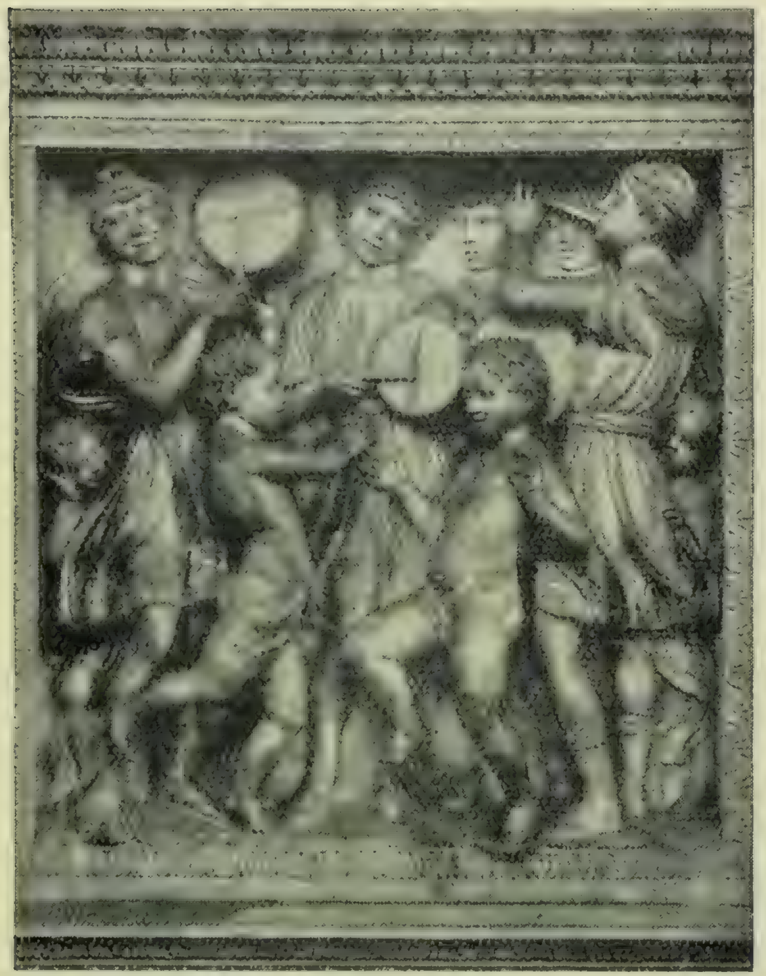
HOW THE MYTHS OF ANCIENT GREECE WERE CARVED IN THE PARTHENON.

In this huge temple there were ninety-two metopes, which are square panels telling, in relief work, the favourite tales in Greek mythology. The legend carved in relief here is the celebrated fight of the Centaurs and Lapiths at a marriage feast.

The chief splendour of this edifice was the ivory and gold statue of Athena by Pheidias. It no longer exists, but there are accounts of it in old writers, and a few coins remain which bear its representation, so that we may get an accurate idea of it still.

" The Discobolus," or Quoit-Thrower, the work of Myron, one of the first of the Greek sculptors, who lived 500 years before Christ, is admirable for the accuracy of every bone and muscle in the body. Two other pleasing works are the " Charioteer of Delphi " with his serious, attractive face and his long tunic falling in very graceful folds ; and the other is the Boy pulling a thorn out of his foot.

To Praxiteles, another of the splendid Greek sculptors, is due the production of two of the world's masterpieces, one being the " Aphrodite," or Venus of Cnidus, while the " Hermes," found over fifty years ago in the ruins at Olympia, is the other. Notice the delicious, mischievous smile at the corners of Hermes'



The della Robbias, Florentine sculptors, did much fine work in enamelled terra-cotta. "The Dancing Boys," part of which is seen above, is one of their masterpieces.

mouth, the dimples on the chin, the lovely curves of the body with its perfect proportions?

HOW GREEK ART SPREAD TO MANY COUNTRIES OUTSIDE OF GREECE.

Other and considerably later productions of the great age in Greece are the statues of "Demeter of Cnidos," the goddess of the corn and the protectress and perfect model for all who are mothers, and the "Victory of Samothrace." This latter work was made to commemorate a naval victory and was placed on the prow of a ship.

After the brilliant conquests of Alexander the Great, Greek art became more dispersed outside of Greece itself. Now the two most prominent centres of the last stages of Greek art were Pergamos and Rhodes. These schools were the authors of the well-known "Laocoon Group," an unsurpassed study of human suffering, and the "Farnese Bull," which is rather like a picture carried out in marble, so very elaborate is the design; this, too, is another study of terrible pain.

It was about one hundred years before the birth of Christ that Roman art came under the influence of Greece, but the true beginnings of the art of the Roman people (one of the great types of art) are traceable to another source.

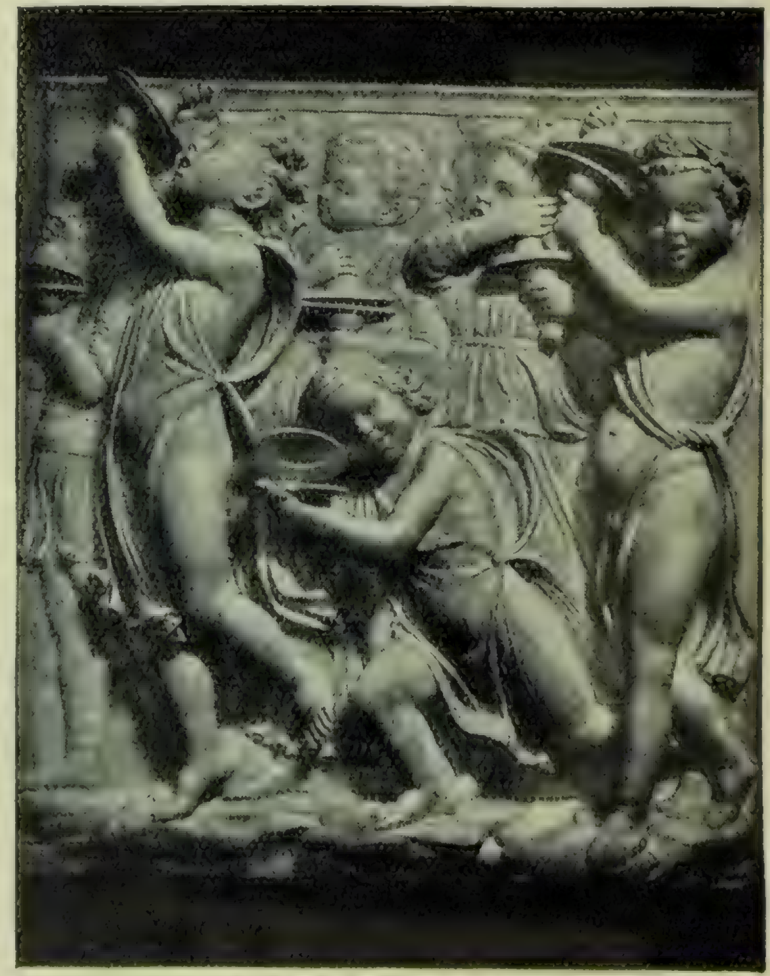
About 290 B.C. the Romans conquered the Etruscans, who had a well-developed art employed in their funeral customs (perhaps a little similar to that of the Egyptians in this respect), and this art passed into Roman civilisation.

HOW A ROMAN EMPEROR CELEBRATED A VICTORY IN OLDEN DAYS.

The Romans were a very practical race, good at engineering and capable in warfare. Thus it is not surprising that they gave us some of our most common architectural forms, like the arch, the vault and the dome.

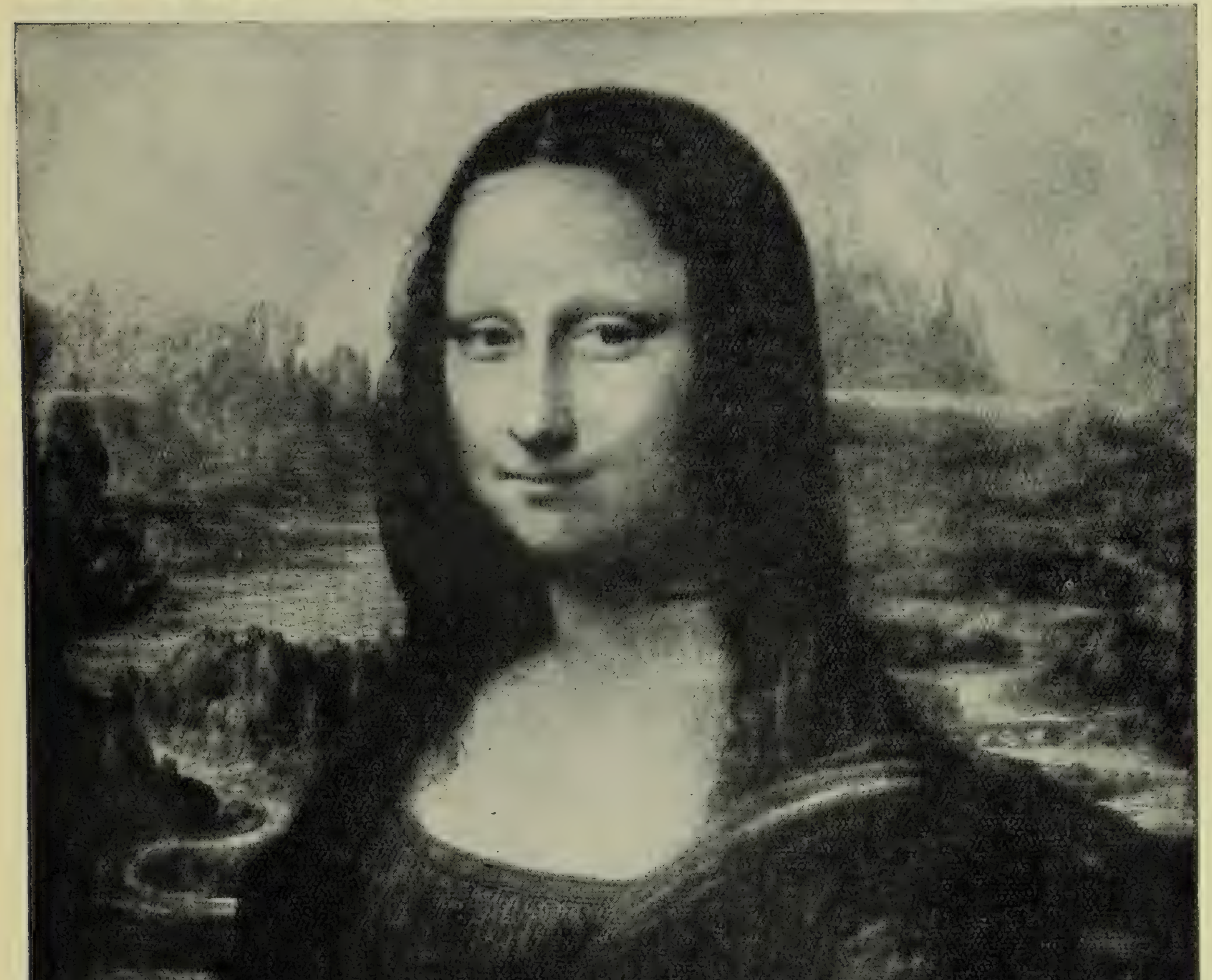
When the Roman emperor had won a great battle quite often he himself, or his senate, erected an arch as a lasting memorial of the event. The "Arch of Titus," celebrating the capture of Jerusalem in A.D. 71, is one of these arches. From examining it we are able to find two main features of Roman art. One is that it tells a definite story of history (in this case the account of the taking of Jerusalem and the sacking of the treasures contained in the famous temple), and, secondly, it gives an impression of events actually happening. The arches of Septimius Severus and of Constantine the Great are very splendid.

Of the numerous temples in Rome the finest is the Pantheon. This colossal building consists of a portico having sixteen granite pillars in one of the Greek styles, and a rotunda or round



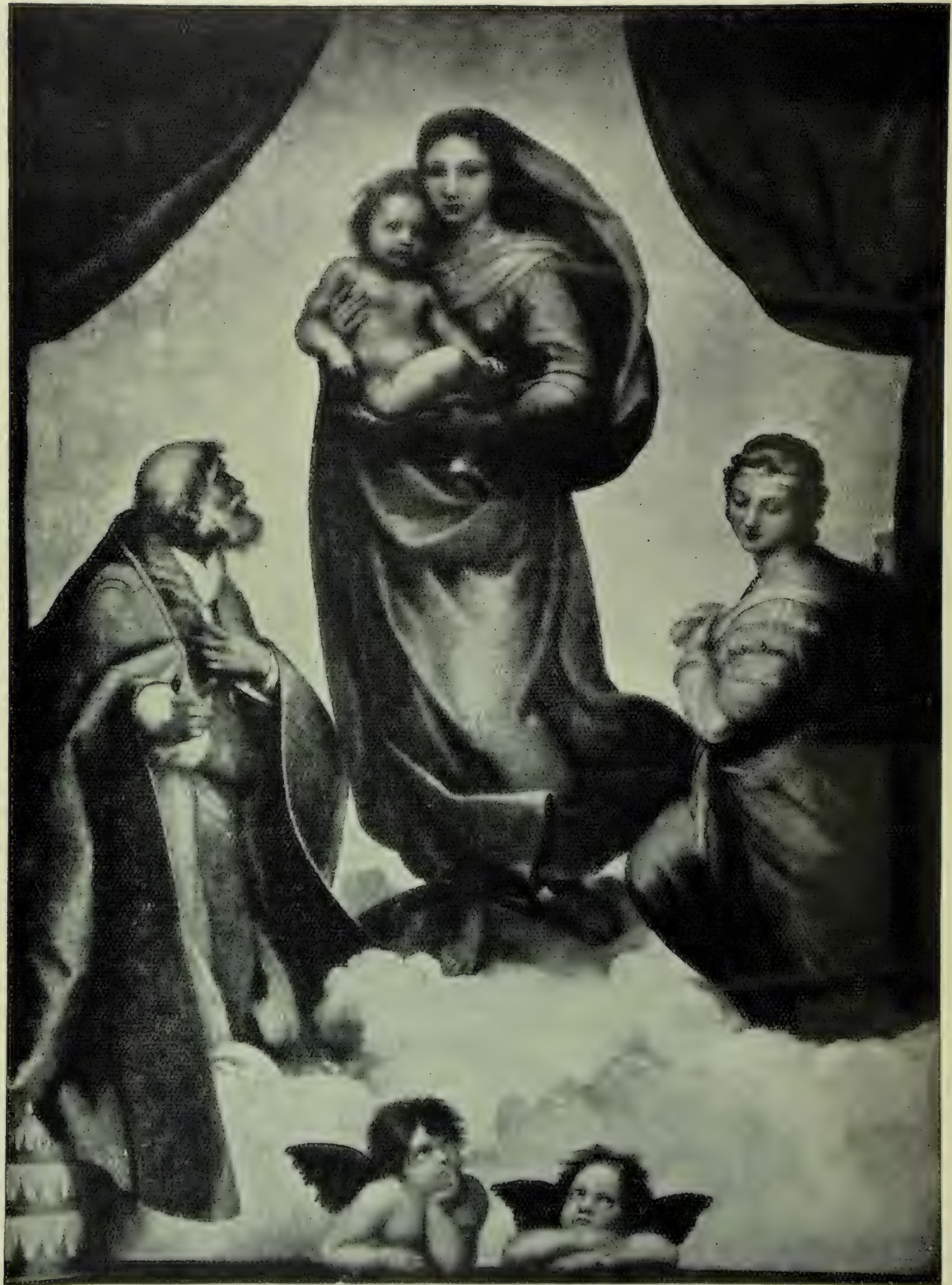
Another part of "The Dancing Boys," showing the musicians with their curious instruments. The della Robbias for generations were famous in the world of art.

THE SMILE THAT ALTERS NOT WITH TIME



Those of you who are left-handed may take courage when you look on this beautiful picture, possibly the most famous portrait in the whole history of Art. For Leonardo da Vinci (1452-1519), one of the cleverest scientists, inventors and artists the world has ever known, is said to have painted his masterpieces with his left hand. This portrait, with its haunting, mysterious smile, is that of Madonna Lisa, a Neapolitan lady. For four years Leonardo worked at the picture, only asking Lisa to come and sit for him when he was in the mood for the work. He had music played while he lovingly painted, to charm Lisa's smile to her beautiful face. We now know the portrait as " Mona Lisa."

BEAUTY, MAJESTY AND DIVINE GRACE



In the early sixteenth century the great Raphael, cleverest painter of Madonna pictures the world has ever known, finished the above picture. The painting, probably Raphael's most famous work, was executed for the monastery of St. Sixtus at Piacenza. In the picture Pope Sixtus is on one side of the Virgin and St. Barbara is on the other. When we look at the painting, however, our eyes are drawn to the beautiful and tender representation of the infant Jesus in his mother's arms. Raphael's last work, before he died in 1520, was "The Transfiguration."

building with a dome at the top. It stands 140 feet from the ground, with a diameter almost as big, and its walls are twenty feet thick! Jupiter, Juno and Minerva were the deities to whom the three principal shrines were dedicated. All the interior was lined with marble, gilded bronze tiles covered the roof, but only the main entrance doors of bronze remain out of all this richness.

For gladiatorial contests, bull fights, boxing and all sports, amphitheatres, copied from the Greeks, were the usual places of assembly. One of these is the Colosseum, a huge oval-shaped structure, about two-thirds of a mile in circumference.

SOME FAMOUS COLUMNS UNDER WHICH EMPERORS WERE BURIED.

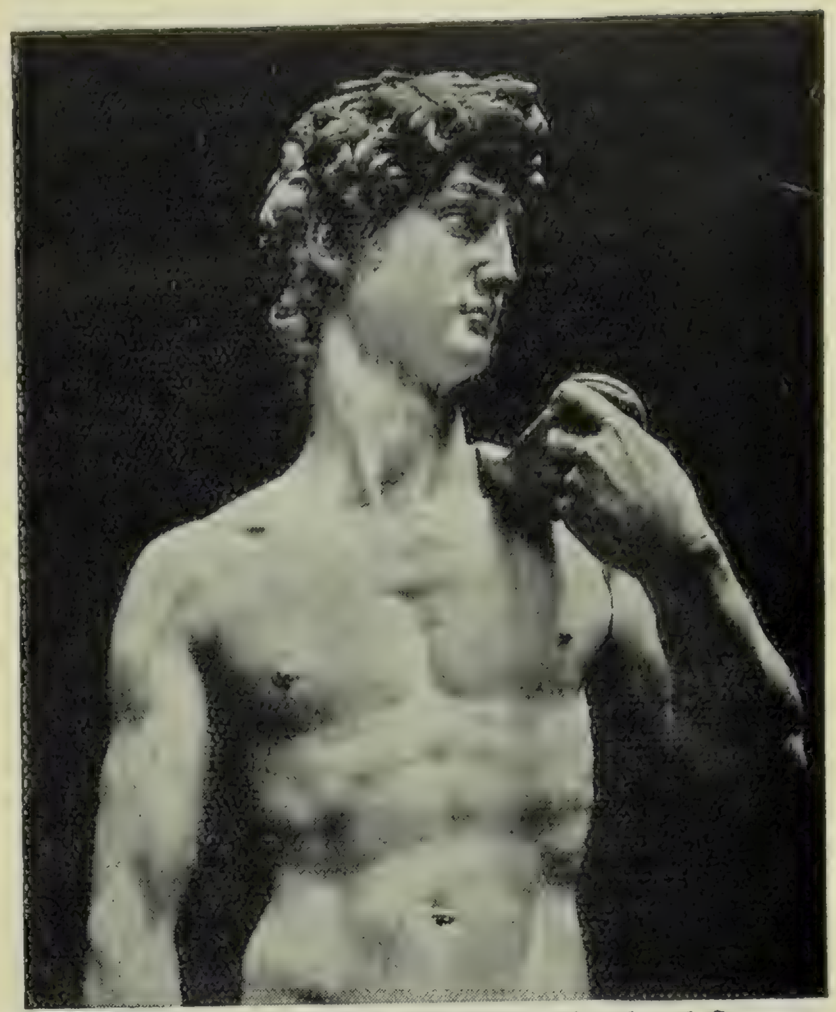
Fifty thousand people could be accommodated in the seats provided, which were reached by eighty separate entrances.

Columns, under which an emperor would be buried at his death, were another type of memorial sculpture and architecture. Trajan's Column, set up in A.D. 115, is one of the most important of these columns, and is, besides, an outstanding example of Roman relief work. Rising 130 feet high and being eleven feet thick it resembles a small tower rather than our idea of a column. On its twenty-three windings is told the story of Trajan's two Dacian wars, the emperor himself occurring a great many times and in all the chief episodes. Nearly 2500 men and women and quite a number of animals come into this long story. There are scenes describing soldiers unloading boats full of stores; pigs, sheep and bulls being taken off to be sacrificed; one of the enemy coming upon the emperor unexpectedly and falling off his mule with surprise; Roman soldiers cutting down wood to make a camp fire; the whole army crossing the River Danube over a bridge made entirely of boats; and, of course, numerous battle scenes.

SOME OF THE MOST BEAUTIFUL EXAMPLES OF SCULPTURE ARE FOUND IN ROMAN TOMBS.

In the fourth century B.C., little figures of terra-cotta, portraying the normal life of Roman citizens, became very popular. Sometimes these were given as presents at times corresponding to our Christmas. Statuettes of fishermen, pastry cooks, barbers, cutlers, and boys and girls playing games have been found.

Quite often on Roman tombs incidents illustrating the occupation of the dead person would be worked in relief. For instance, an embroideress would have some scene taking place in an embroidery shop; if a man had been a cutler, perhaps a testing of blades or grinding of knives would be shown on his monument.


Michelangelo, the celebrated Italian artist, has left many wonderful works behind him. His sculptures, one of which—David—is seen above, and is a good example of his work, gained for him great fame in the world of art.

The Romans liked animals on their vases, their china and silver, and even on their furniture, as well as in their sculpture and painting.

THE ANCIENT CITY OF BEAUTIFUL STATUES AND WONDERFUL CARVINGS.

Rome, during the years of her supremacy, must have been a city of dazzling brilliance, for all the things of service in daily existence were lavishly decorated. But in the fourth century of our era the spread of Christianity and the knowledge of Eastern art which the Romans brought home from conquests in the East, caused a deep change in the work of Roman artists who, after the Arch of Constantine the Great was completed, ceased to create original art and the Byzantine School of Art held sway in Italy.

From about the fourth to the twelfth centuries A.D., the whole world neglected art. France, in the twelfth, and Italy in the next century, tried to revive art, but it was not until the fourteenth century that we have Giotto, the first of the important Florentine painters, often spoken of as "the Father of Modern Painting." He carried out a series of frescoes (these are simply

Michelangelo, the brilliant sculptor, was ordered by one of the Popes to make a great tomb, and on this monument he placed the wonderful statue, "Moses," seen above.

paintings done on plaster while it is still damp) showing the life-story of St. Francis of Assisi. St. Francis preaching to the birds, who listen intently; the saint giving up all his money and belongings before leaving his father's house to live with the fair Lady Poverty. These are two of the frescoes done by Giotto to honour the well-beloved Saint of Assisi. It is to Giotto, the shepherd lad, who passed his early days among the trees, flowers, and birds, that we owe the first trees and animals in modern art.

We have arrived now at the beginning of the fifteenth century, which shares with the fifth century B.C. the distinction of being one of the glorious epochs in the story of art.

You will be pleased with the brilliance and variety of Fra Angelico's colouring in pictures like "The Coronation of the Virgin." See the profusely jewelled steps, the clever grouping of the angels and saints, the graceful form of the Virgin, who, together with the Christ, occupies the centre of the painting. The gold background usually chosen by Fra Angelico is the explanation of the radiant light effects of his works.

Living at the same time as Fra Angelico was Paolo Uccello, who was the first painter to do battle scenes in pictures. One of these, "The Rout of San Romano," which shows the Florentines victorious over the Sienese, is remarkable both for the elaborate plan and the attempt to show the perspective, or relief, of the scene, for perspective was unknown in those days. "A Stag Hunt in a Forest by Night" is another fascinating work of Uccello's. We get rich, deep colours, mainly reds and greens, with a convincing sense of movement in each figure.

HAVE YOU SEEN THE BEAUTIFUL PICTURE, "SPRING," BY BOTTICELLI?

Botticelli we can never forget, for no one has painted more exquisite Madonna and Child pictures than he. His "Spring" is unsurpassed in the realm of art. This work gives a very beautiful idea of "Spring" and the effect she has on the earth when she arrives. Flora, the goddess of flowers, and Zephyr, the West Wind, push Spring towards Venus, who is waiting to welcome her. A cupid, over Venus's head, points his arrow at the Three Graces dancing in a ring. Mercury, the messenger of the gods, announces the return of Spring. Spring herself, dressed in flowered garments, with flowers on her head, trips merrily forward; wherever she places her foot the flowers spring up in response to her light footstep.

Perhaps you may have seen some of the Della Robbia ware done by Giovanni and Andrea Della Robbia. It consists of terra-cotta reliefs overlaid with enamel. Florence Cathedral has the most perfect specimen: ten panels are filled with singing angels and dancing boys, brimming over with liveliness.

THE SCULPTOR TO WHOM WE OWE THE FAMOUS BRONZE STATUE OF DAVID.

A sculptor of this period made one of the finest statues of a man on horseback in the entire world. This is the "General Gattemelata" at Padua by Donatello, who also executed a bronze statue of David standing almost naked, a large hat on his head, with his left foot on Goliath's head, and the dead enemy's sword in his hand.

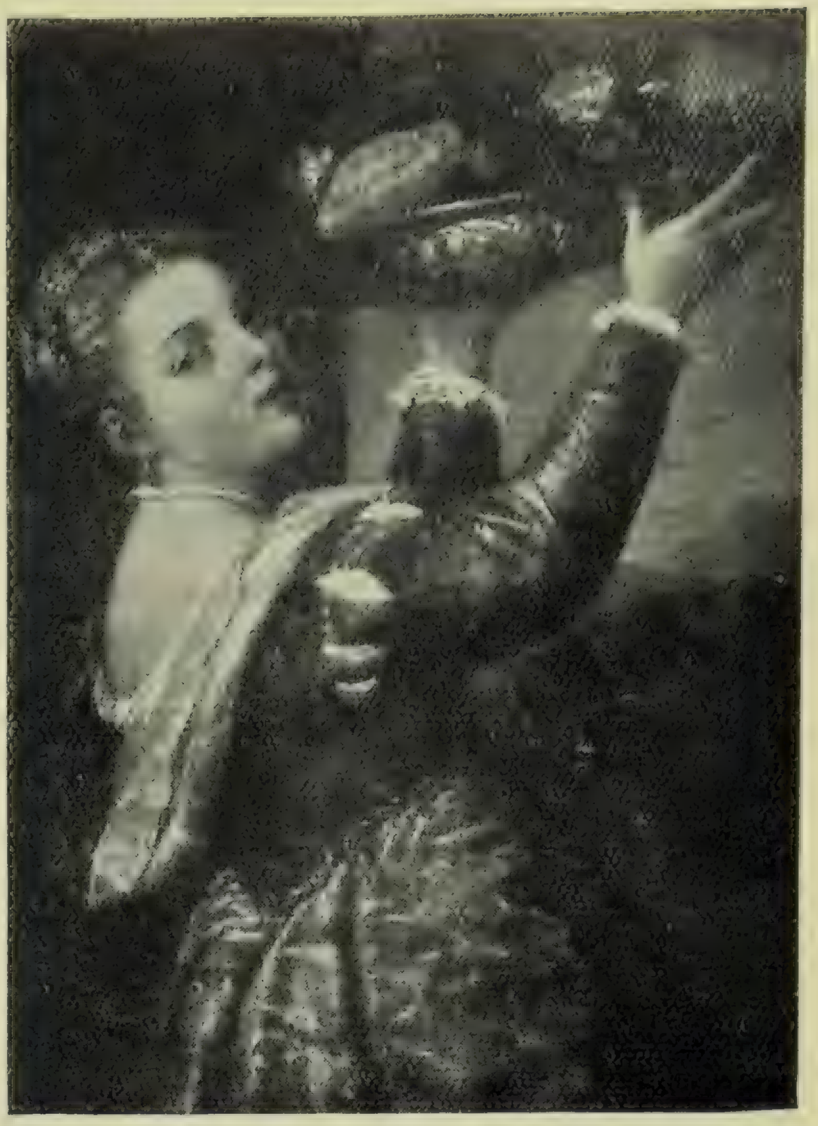
HOW THE REBIRTH OF ART AND LITERATURE AFFECTED THE WORLD.

The Renaissance (which means the rebirth of art and literature after many years of neglect) produced one of the greatest men who have ever lived, for, besides being an artist of the highest rank, Leonardo Da Vinci was an engineer, a goldsmith, a chemist, an inventor, a writer, a musician. Nor does this give a complete idea of all that he was able to do. Often he set free the caged birds which he saw put up for sale in the market, for he was fond of all birds and animals. Dogs, lions and horses he enjoyed painting. "The Last Supper," familiar to most of you, is a work of this genius. The "Mona Lisa" or "The Joconda," in the Paris Louvre, is another marvellous work by Leonardo. This portrait took six years to complete. The right hand of this woman is often studied for its great perfection.

"The Virgin of the Rocks," and the "Virgin and Child with St. Anne," are more masterpieces of this Italian artist, and in both there is another trace of the curious, original Da Vinci smile. In the former painting the light is of a peculiar grayish-green tint.

THE BRILLIANT SCULPTOR WHO WAS ALSO A PAINTER, POET AND ARCHITECT.

Michelangelo, never surpassed in art except by the Greek sculptor, Pheidias, was a poet, architect and painter as well as a sculptor. One of the Popes ordered him to make a splendid tomb, and it is on this monument that he put the statues of "Moses" and "The Two Slaves." These two statues show a human being rebelling in one case, and having lost all hope in the other. In the Royal Academy at London there is a marble relief of the Virgin and Child with St. John the Baptist holding out a bird to the little Christ-child, who is frightened by its flutterings. But it is in the Sistine Chapel in Rome that we have the surpassingly wonderful work of Michelangelo. Here, for four and a half years, he was engaged in painting a series of pictures on the ceiling of the chapel, which tell the story of our world from the Creation to the Deluge. The Creation of Adam, and Adam and Eve being sent out (after their Fall) from the Garden of Eden, are among the finest of these magnificent paintings. Sibyls and Prophets and many other figures enrich the spaces between each part of the history. The Prophets and Sibyls particularly give the appearance of being sculptured rather than painted; they are big, full of life and strength.



Titian was perhaps the world's greatest portrait painter, and in this picture of his daughter, "Lavinia," he is seen at his best. Like many of the famous "old masters," he was a native of sunny Italy. Five of of his works are in London.

A GLIMPSE AT SOME MORE FAMOUS ARTISTS WHOSE WORKS WILL LIVE ON.

Raphael, who lived at the same time as Michelangelo, but died young, painted some excellent Madonna and Child pictures, as the "Madonna of San Sisto" and the extremely attractive one at Paris, "La Belle Jardinière." The body of the baby Christ is well modelled and the intent look on his face is attractive. In the back of the picture is a pleasant landscape, which sets off the figures to a greater advantage.

Titian, whose greatest picture is "The Presentation in the Temple," and who has done a striking portrait study of "Charles Fifth" riding on horseback across a battlefield as the dawn breaks, is renowned for his rich, lovely colours; perhaps we may even speak of him as the world's supreme colourist.

Jacopo Robosto, nicknamed "Tintoretto," which means "Little Dyer," for his father was in the dyeing trade, was a very able pupil of the great Titian. "The Miracle of St. Mark," describing the story of the patron saint of Venice delivering a Christian slave from pagan torturers, is his masterpiece. With the death of Tintoretto in 1594 the splendid period of art in Italy came to an end and other countries took up the supremacy in this domain.

In our own country the true beginning of art was at the end of the sixth century when England became Christian, but right up to the eighteenth century the development of art in Britain is disconnected and obscure.

DO YOU KNOW WHO WAS OUR FIRST GREAT NATIONAL PAINTER?

In Westminster Abbey and the cathedrals of Winchester and St. Alban's fragments of wall paintings can still be seen. These were done during the thirteenth to the sixteenth centuries, when the ornamenting of church walls with paintings was a usual custom, one reason for it being that it assisted those who could not read to know their Bible and the lives of the saints in an easy way. An excellent painting, known as the "Wilson Diptych," was done about 1380. The attitudes of the angels in the right-hand panel are very charming, in particular the two in the very front. The wings show a lot of clever work too. In the fifteenth century our country was too occupied with wars to worry about art, and although in the Tudor and Stuart periods portraiture was popular it was largely done by foreigners. Not until as late as the eighteenth century do we get our first great national painter, William Hogarth. Hogarth enjoyed telling a story in pictures. He had a gift for making clear the true character of his model or hero or heroine in his works, as you will notice in his painting of "A Shrimp Girl," a striking study of a girl in a gay mood, brimming over with life and jolliness.

WHO PAINTED THE FAMOUS PICTURE, "THE AGE OF INNOCENCE"?

Richard Wilson, the only important Welsh painter, is the "Father of English Landscape," because he, in paintings such as "The Italian Coast Scene" and "On the Wye," was the first British artist to paint natural scenery and surroundings.

It is to Sir Joshua Reynolds, who founded our Royal Academy, that we are indebted for our first portrait studies of typically English men and women. Two charming productions of his are "The Strawberry Girl" and "The Age of Innocence."

Gainsborough was a fine portrait painter, as we may see in the winning portraits of his two daughters, Mary and Margaret, and the one of "The Hon. Mrs. Graham."

Scotland has one great painter who spent practically all his life in Edinburgh and was a thorough Scotsman in his character. Sir Henry Raeburn is at his greatest in the paintings of "Sir John Sinclair" and "The McNab."

Of all British painters the greatest and the most original is J. M. W. Turner. Turner was passionately fond of the sea and of ships, and so many of his paintings are of these. There are "Calais Pier," "The Sun rising through Vapour," "Ulysses deriding Polyphemus," and "The Fighting *Téméraire* towed to her last berth," which shows a magnificent battleship being drawn along by a small, modern tug. Here the beauty and stateliness of the grand old ship and the ugliness of the little tug are markedly emphasised; marvellous sunset colours flood the canvas, as though the real sun were behind.

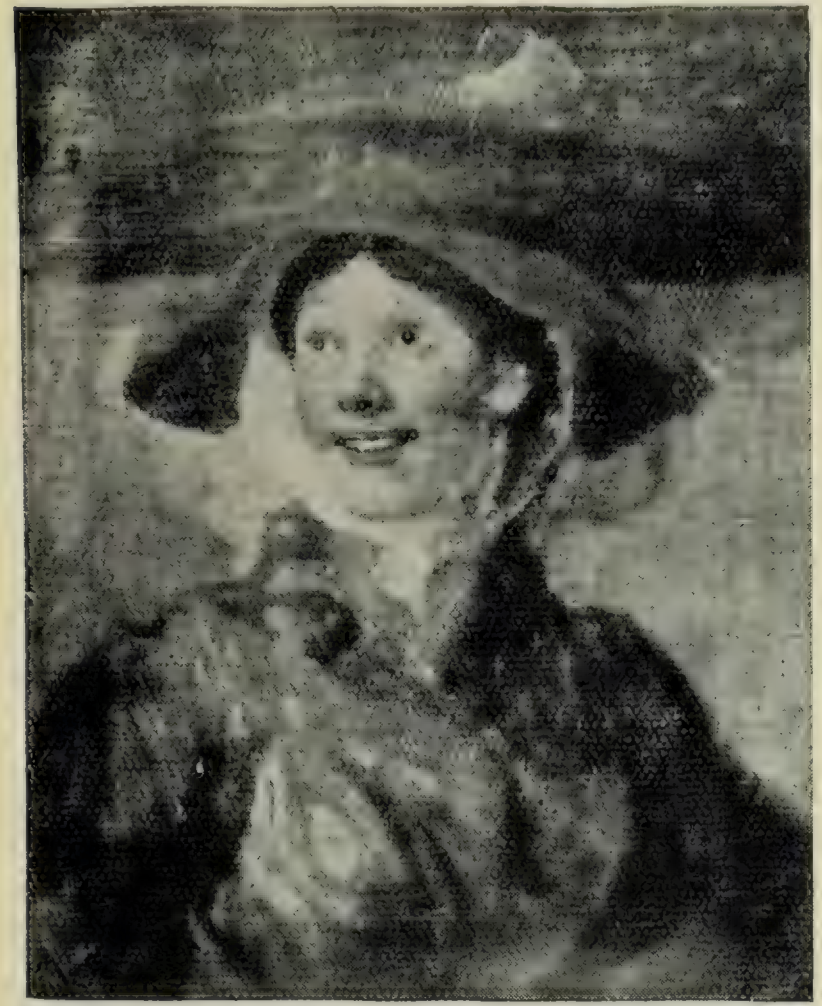
HOW SIX ARTISTS AND ONE SCULPTOR JOINED TOGETHER TO FOUND A GREAT BROTHERHOOD.

Have you ever seen the "Hay Wain," where the trees and sky are ruffled by the wind? John Constable, who was living when Turner was painting and who was famed for his landscape studies, did this work. Other attractive pictures of his are "Flatford Mill," "The Cornfield," "Boat-building," and "The Leaping Horse," all of which you can see for yourselves when you are in London.

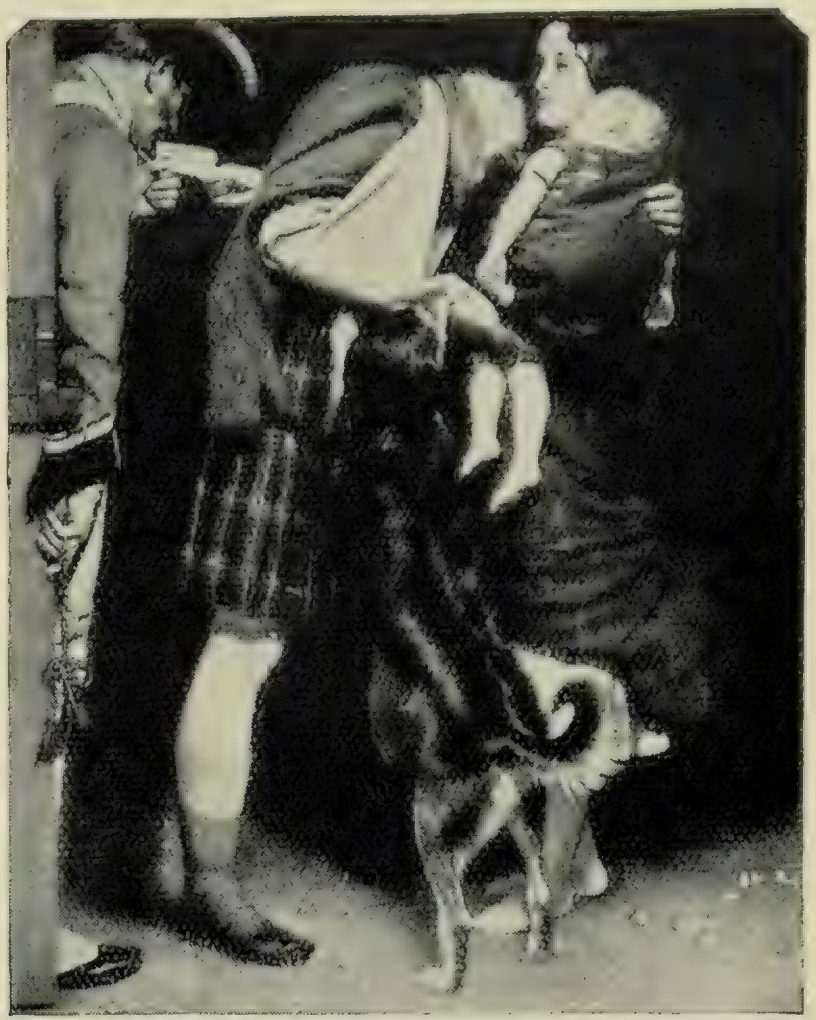
In the middle of last century six artists and one sculptor joined together and founded what is known as "The Pre-Raphaelite Brotherhood," which has had a considerable influence on art. These men thought that art had grown too artificial and complicated; so their plan was to study the artists who lived before Raphael and in this way to bring back to modern art the freshness and simplicity of an earlier age. Another Pre-Raphaelite idea was to observe natural objects with attention and to paint them with great care for detail and truth.

One painter of this group was John Everett Millais, who produced a good study in the blending of colours in "Ophelia," and two narrative works in "The Order of Release" and "The Boyhood of Raleigh." This last painting is very inspiring and sums up the dreams of a great many boys and girls. "Christ in the House of His Parents" is interesting, for it is a sacred subject treated as though it were an incident in daily life.

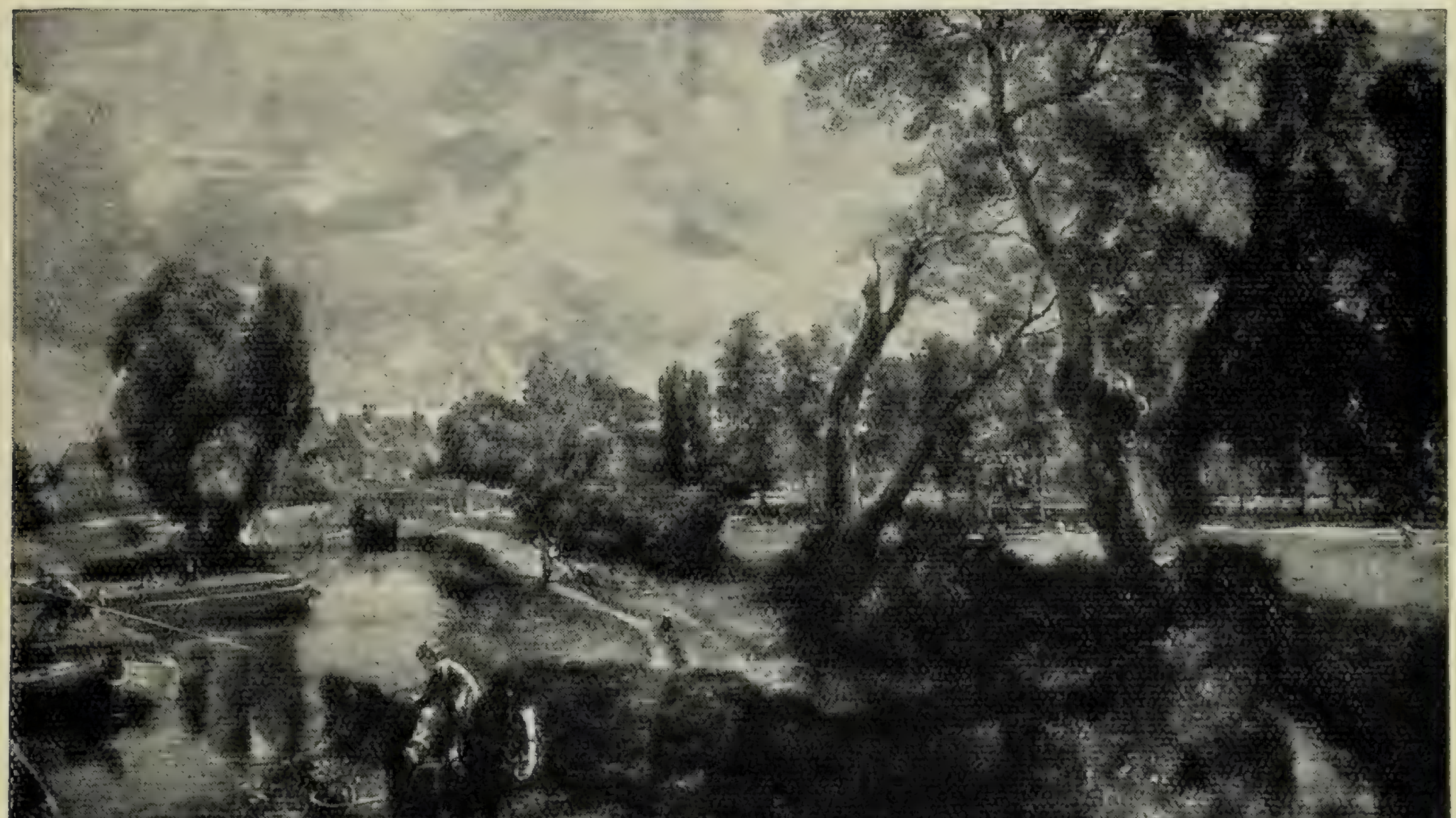
HOGARTH, MILLAIS, AND CONSTABLE



In the National Gallery in London may be seen the jolly portrait of "The Shrimp Girl," by William Hogarth, the well-known English painter and engraver (1697-1764).



The Scots wife presents to her soldier-husband's jailer "The Order of Release." The painting, behind which you can read a story, is by Sir John E. Millais (1829-1896).



This marvellous piece of landscape, "Flatford Mill on the Stour," shows the great artist Constable (1776-1837) at his best. The mill has been bought for the nation so that the glorious view may be preserved for all time. The picture may be seen in the National Gallery. Constable also painted portraits, but is better known for his landscapes.

Millais actually studied in a carpenter's shop in order to make the painting true in all details to ordinary life.

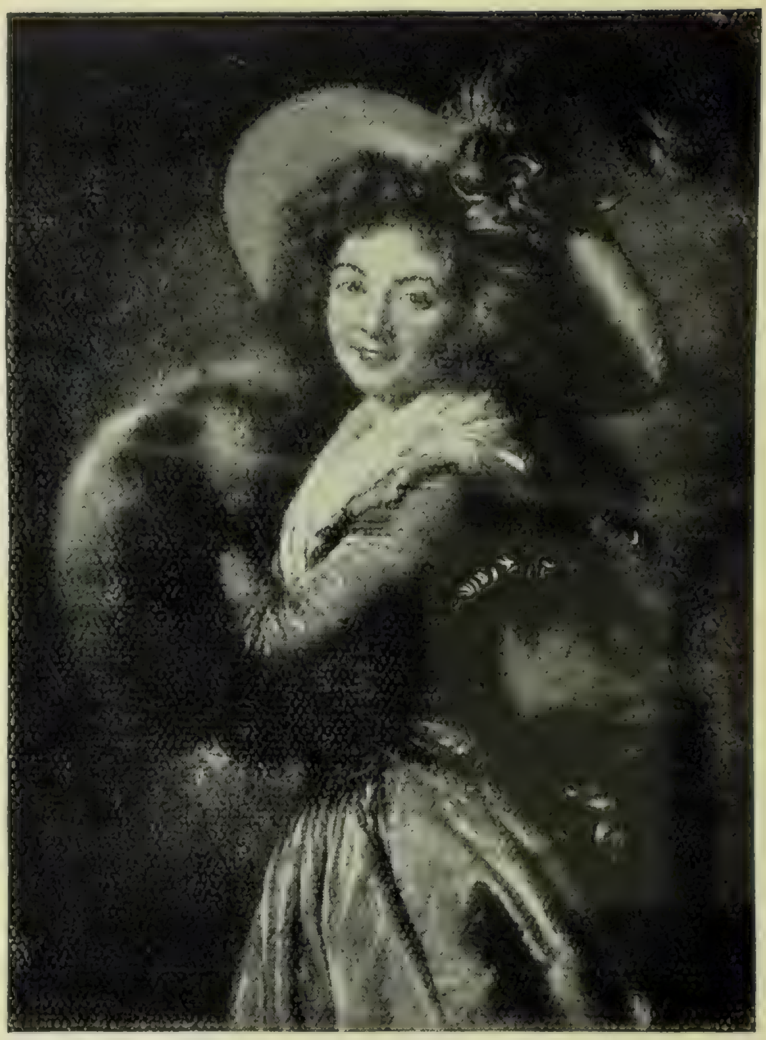
THE ARTIST WHO ILLUSTRATED CHAUCER'S "CANTERBURY TALES."

Sir Edward Burne-Jones was a thorough Pre-Raphaelite. Once you have become used to his style you will recognise his work whenever you come across it. He was fond of the English poet, Chaucer, and one of his first oil paintings was an illustration of "The Prioress's Tale," one of the "Canterbury Tales." Later, he painted the whole story on a cabinet, now to be seen at Oxford. Holman Hunt and Dante Gabriel Rossetti are also pre-Raphaelite artists. From Ford Madox Brown, who although not a member of the brotherhood was deeply affected by their ideas, we have two strikingly beautiful and realistic works on sacred subjects. One is "Christ Washing the Disciples' Feet," in which the deep shape of the copper bowl seems to throw out light over the entire picture; the second one is the fascinating "Our Lady of Good Children."

SOME MORE MODERN ARTISTS AND THEIR PAINTINGS.

Watts, whose "Sir Galahad" you will quite likely have seen in your schoolrooms or library, was attracted towards making abstract ideas, like hope, love or life, into persons who, by their figures and attitudes, would give that definite meaning which Watts had in his own mind. You can see this in "Hope," "Love and Life," and "Mammon."

From about 1875 to the Great War art was concerned chiefly with giving an impression of people and objects as they appeared to the artist on a first glance. It was really an attempt to get back the freshness and spontaneity of Renaissance and pre-Renaissance art. In our own days, since the war of 1914 to 1918, movements among painters and sculptors have altered again; and the latest aim is to make works of art true to the persons and things depicted and full of the small details which mark off one object from another of its kind—our modern art inclines towards realism. After the vague outlines and merely suggested, often seemingly disproportioned, subjects of the Impressionists (this was the name given to those who painted their subject according to their first impression of it), we are turning again to those styles which produce a feeling of solidness in art. There is in some of the most recent art, in some of Sir Charles Holmes and of Sir George Clausen, so strong a feeling of solidity that the picture seems to have been built up bit by bit almost in a way that buildings are put up. Sir William Orpen's portraits show us something of the same strong quality—while for vigorous presentment of character those of Augustus John are unique in modern art.



Forced to leave Paris during the French Revolution, Madame Vigée Le Brun visited Italy, Germany and England, and painted many famous people, including Lord Byron. "Mademoiselle Molé Raymond" is one of her best known works.

HOW ARTISTS ALL OVER THE WORLD ARE CREATING BEAUTY.

To-day, probably owing to the ease and quickness with which one can get into communication with any part of the world, there is no national art as in former times. Art is world-wide, and Paris has for some years been the centre of fresh activities in this sphere. British artists are being much influenced by modern French and Dutch painting. England now possesses several painters whose genius displays itself in the capacity for a very solid style of painting, so strong that weight and density are felt, and this is a new phase in artistic development. It is *original,* and is an experimental way of trying to bring to life Beauty seen through the eyes of living artists.

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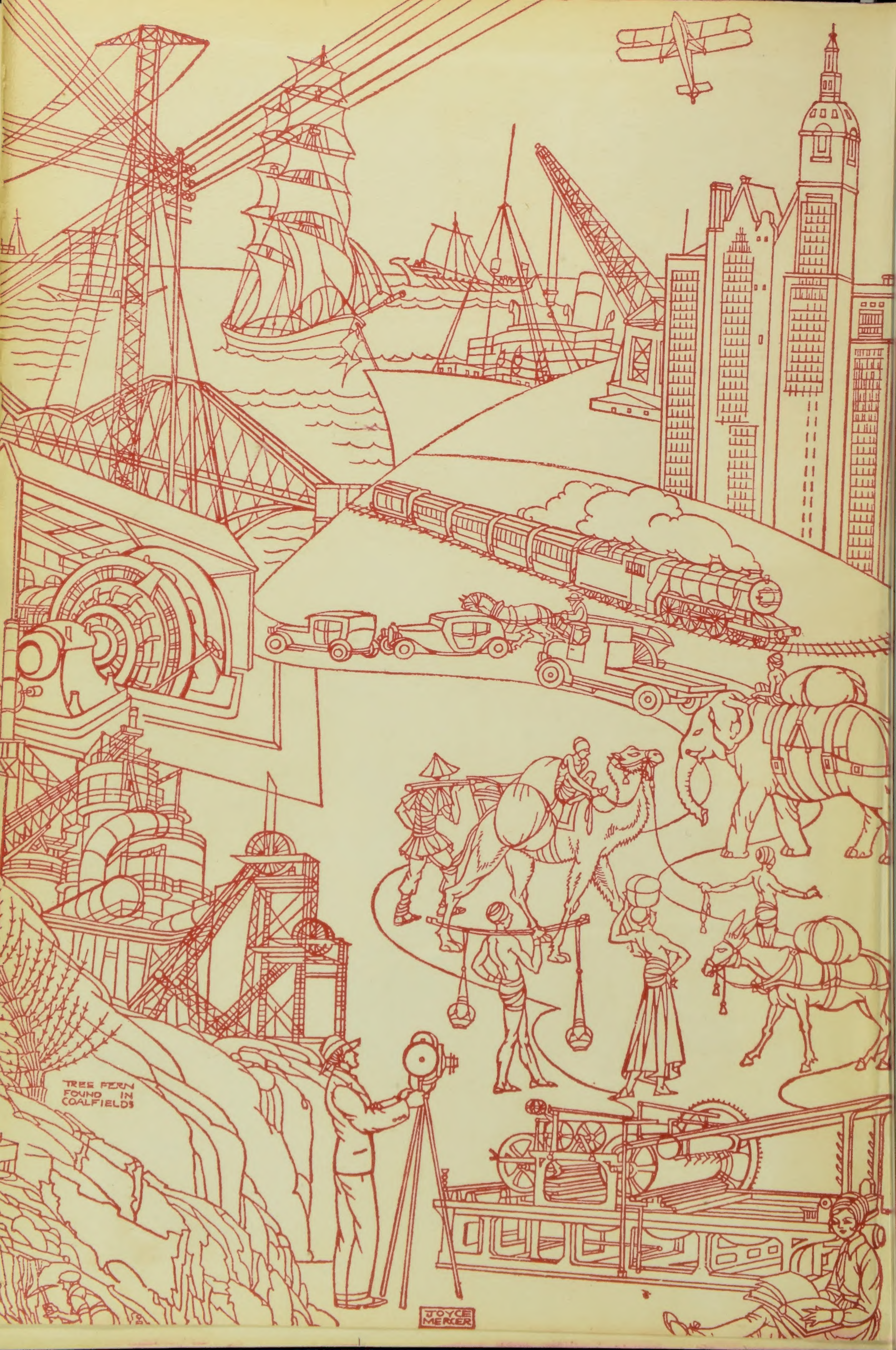
TREE FERN FOUND IN COALFIELDS
JOYCE MERCER